IRON & COAL

THE IRON AND COAL TRADES' REVIEW

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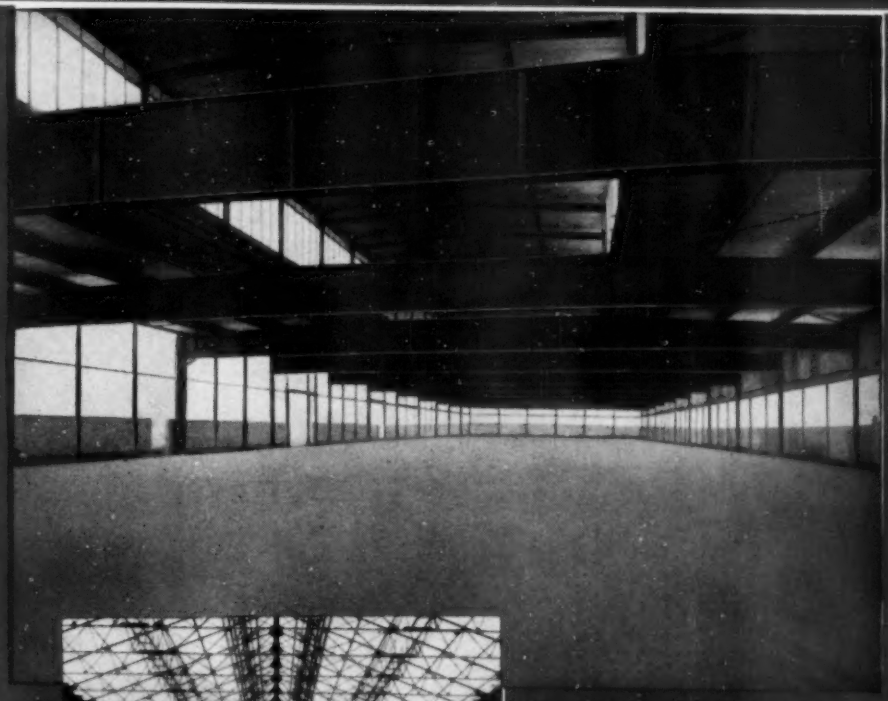
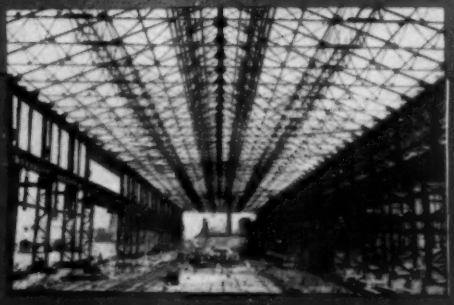




Billet Mill at Dargvor Steelworks, India

Long and varied experience of the fabrication and erection of heavy structural steelwork contributes to the success with which ARROL handle widely differing contracts. These photographs illustrate this diversity of activities and reflect their high reputation throughout the world.

Approx. 300' Production Shop for English Steel Corporation Ltd., Openshaw, Manchester.

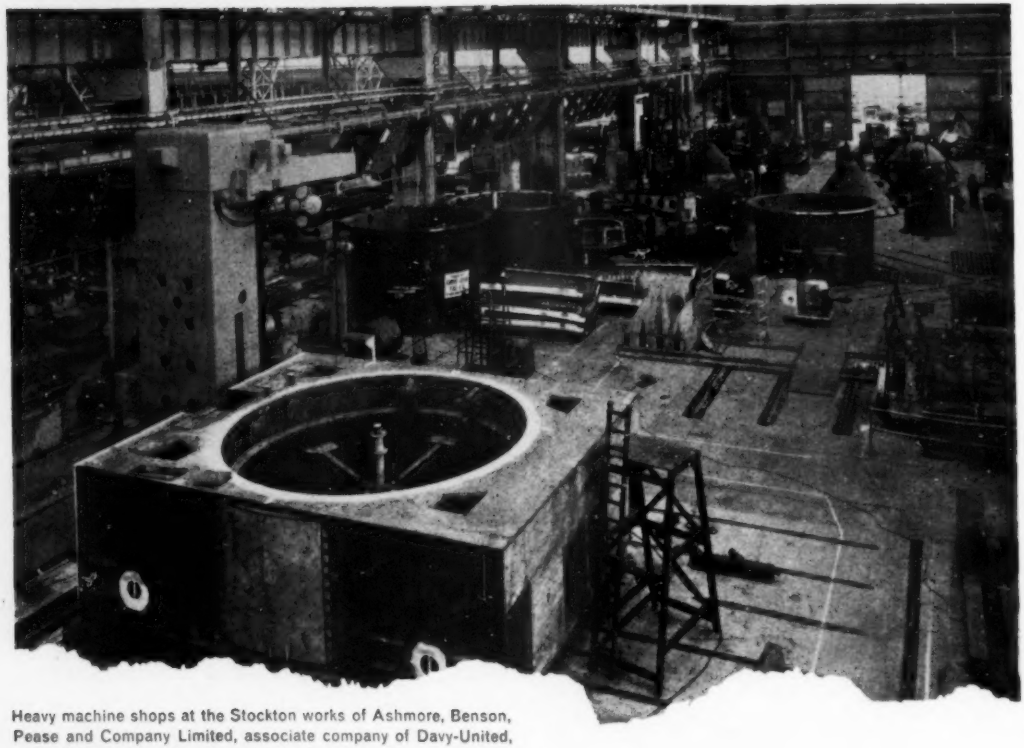
Steelwork for Industrial Buildings

All Types of Steel Framed Buildings; Fixed and Overhead Travelling Cranes and Mechanical Handling Plant; Blast Furnace Plants and Furnace Cowpers; Compressed Air Locks; Hydraulic Installations; Pipe Lines; Surge Towers, Sluices and other equipment for Hydro-Electric Projects.

SIR WILLIAM ARROL & CO LTD GLASGOW

Arrol

Steel PROCESS PLANT



Heavy machine shops at the Stockton works of Ashmore, Benson, Pease and Company Limited, associate company of Davy-United, where fabricated steel process plant and equipment in excess of 100 tons is handled

DESIGN · MANUFACTURE · ERECTION

Complete oxygen steelmaking shops
Top blown, bottom blown and rotary converters
Ancillary equipment . . . casting ladles . . . scrap charging cars . . . slag ladles and carriages
Continuous casting plants
Project engineering for complete steelworks development schemes

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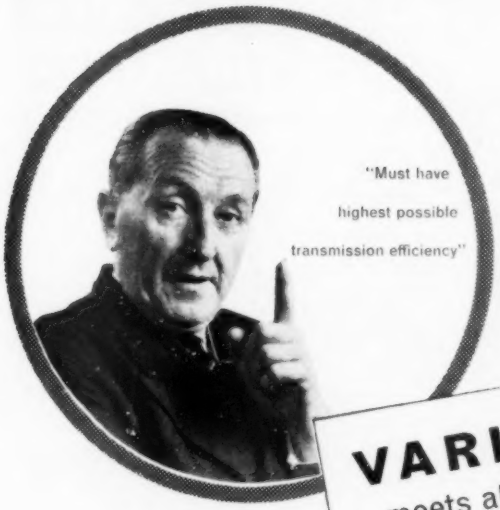
503

Four men in search of a stepless speed reducer



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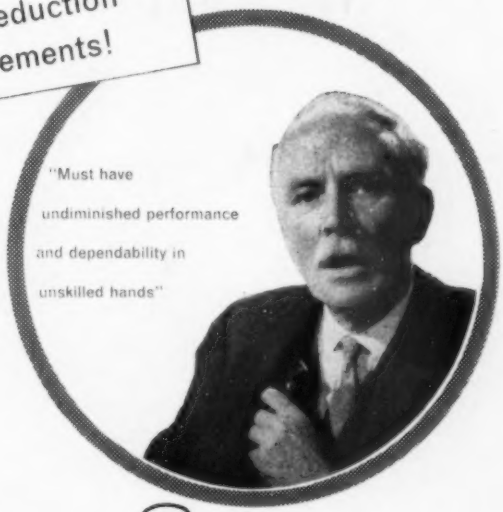
meets all variable speed reduction requirements!

"Must have versatility of application and control"



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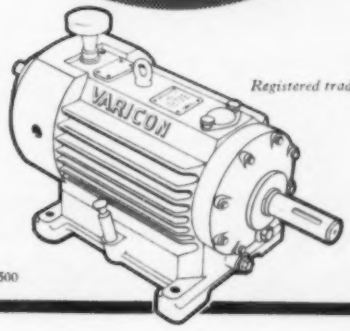

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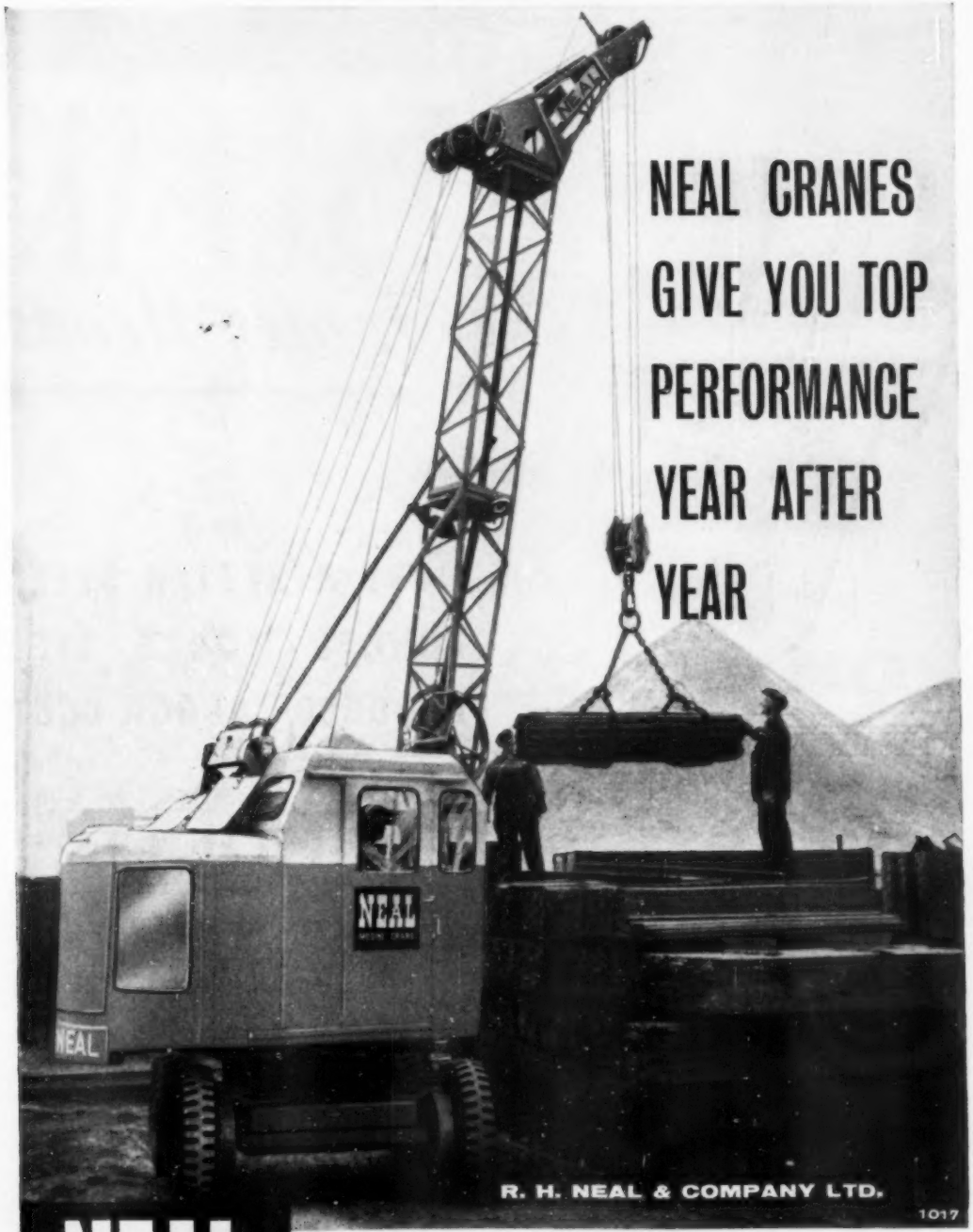

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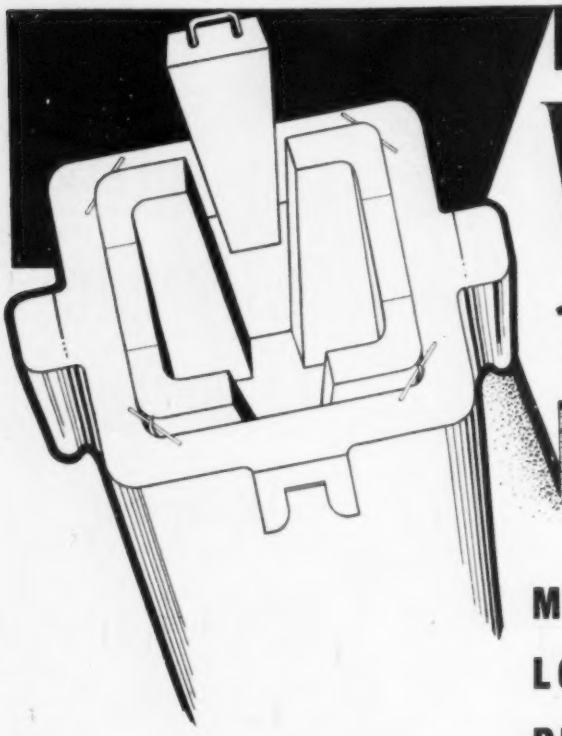

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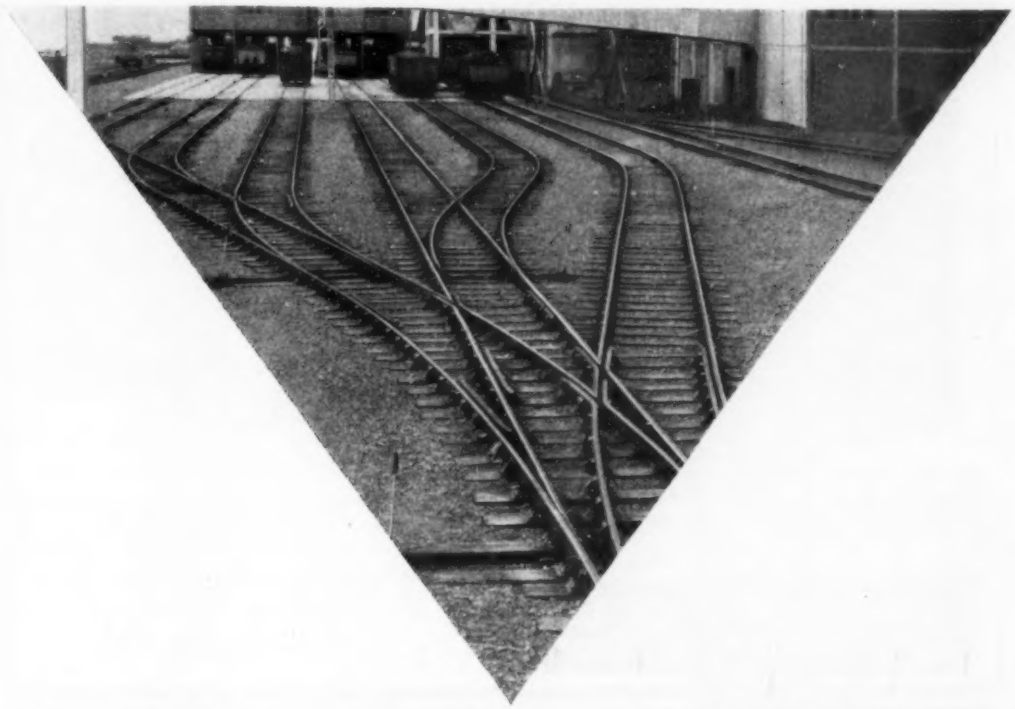

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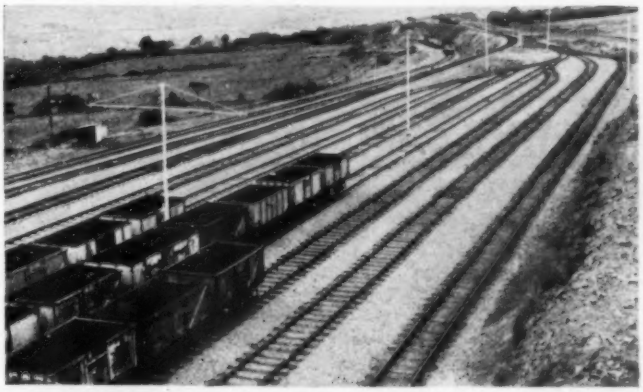

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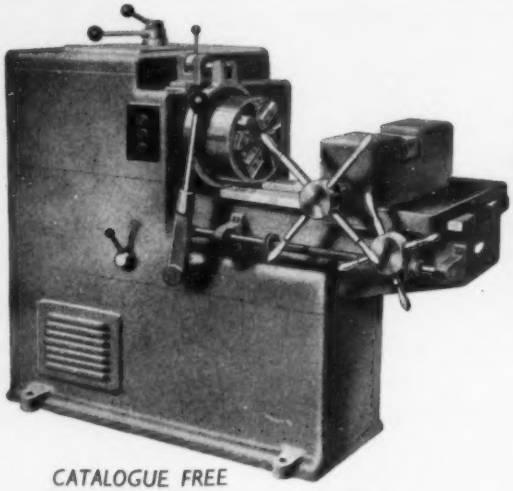

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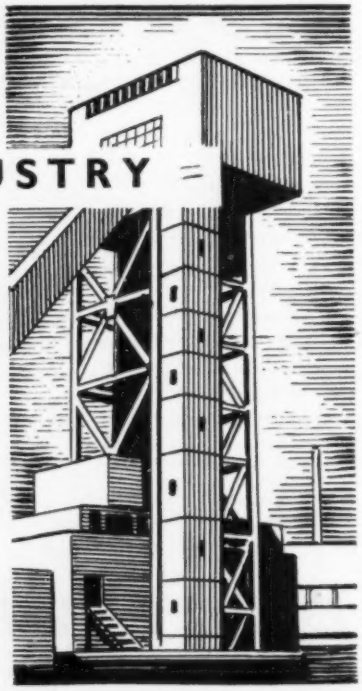

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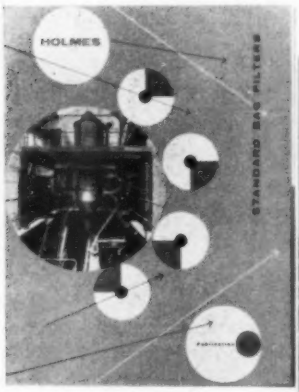
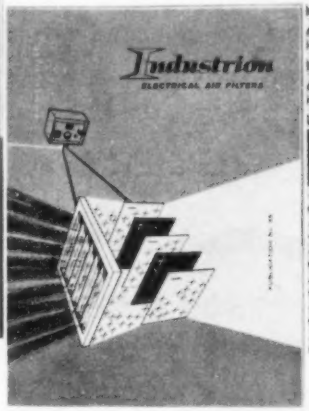
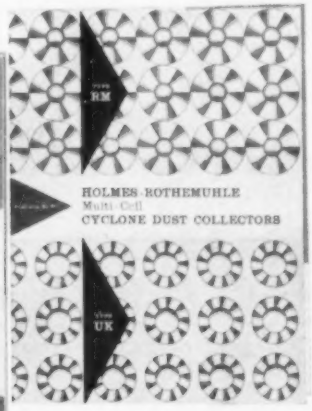
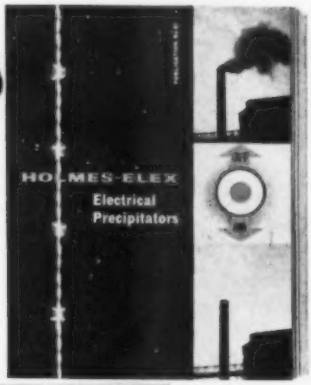






Which?



Which type of dust collection and control plant is most suitable, both technically and economically, for your particular application? A complete answer to this question lies within the pages of the various brochures illustrated. Have these brochures before you when you decide.

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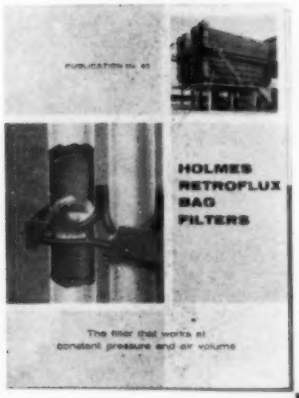

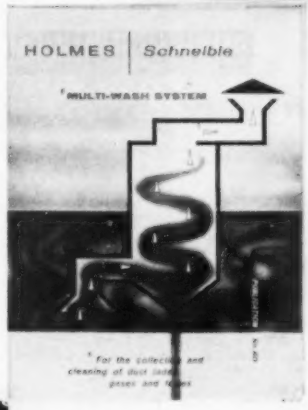

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WITH THE NEW

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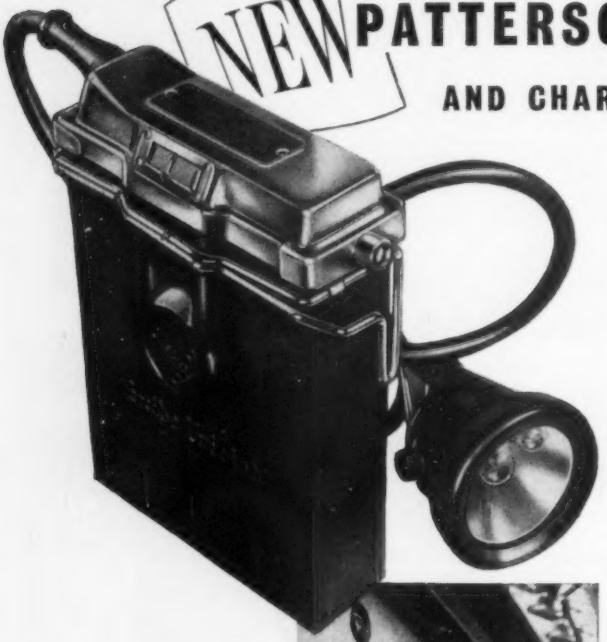

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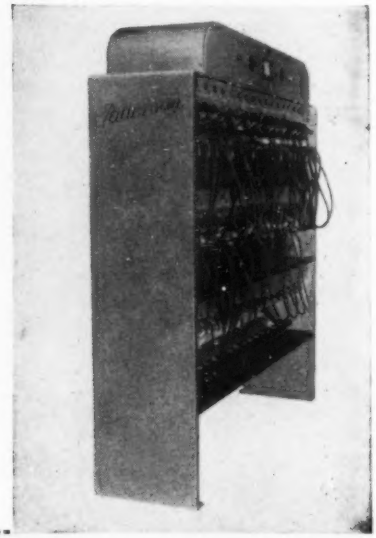

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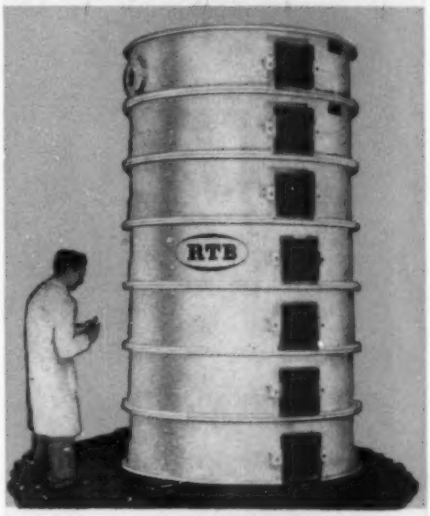

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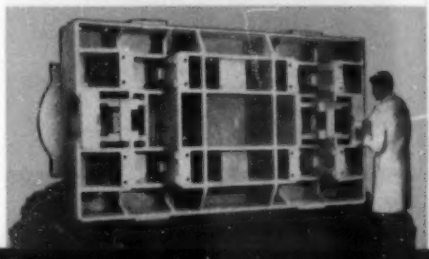
View of underside of 80-ton capacity ingot car supplied to Ebbw Vale Steel Works.



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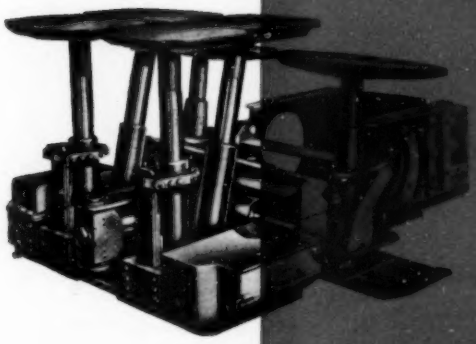

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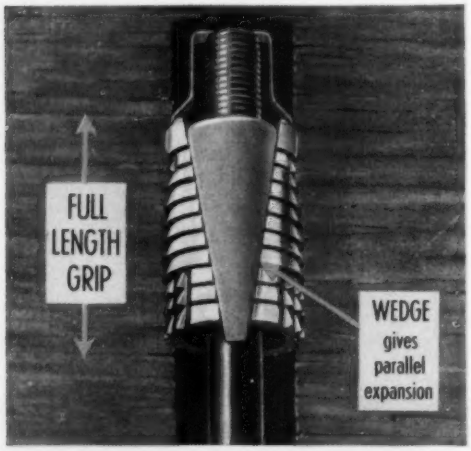

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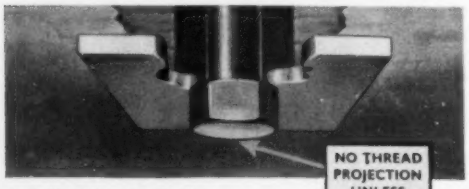

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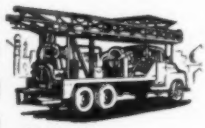

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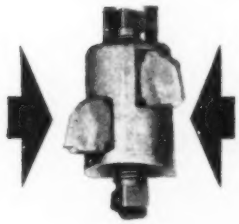

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coal cutter chain

T.K.1.

when you call in Boyles Bros. ...

3 factors will decide the final outcome

Equipment

We make it! We manufacture a complete line of modern diamond drills—underground and surface models, compressed air, gasoline or diesel power. Capacities range from 200 to 5000 feet. We also manufacture hundreds of auxiliary items—everything from core splitters to 60-foot derricks. We are exclusive manufacturers of PERMASET diamond bits and reaming shells—available in all standard sizes and in a multitude of patterns developed to penetrate every known formation with speed, economy and maximum core recovery.

Experience

We have it! During the last 30 years, Boyles Bros.' crews have successfully completed more than 3000 contracts in mining areas throughout the world. As a result of this wide experience we have developed equipment, techniques and procedures to cope with every formation, every transportation and climatic problem likely to be encountered on drilling operations anywhere.

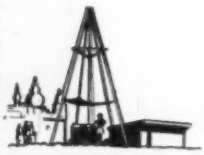
Efficiency

We maintain it! Once begun, no Boyles Bros. drilling program is ever halted for want of men, equipment, bits or parts. Crews are handpicked for experience, dependability and local knowledge; they operate under expert supervision at all times. With strategically located branches and subsidiary companies, we are equipped to render real service in core or blasthole drilling, foundation tests, soil sampling, horizontal drainage drilling and other related problems.

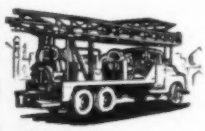
For information and quotations, submit your requirements to Newcastle upon Tyne, 3.

UNITED KINGDOM

AFRICA



FRENCH MOROCCO



PAKISTAN

RUSSIA

...all three work constantly for you on every job we do.

WE LOOK INTO THE EARTH

BOYLES BROS

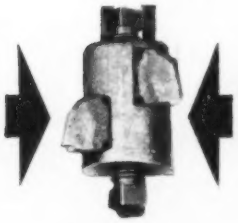
DRILLING COMPANY LTD.,

NEWCASTLE - UPON - TYNE 3

ENGLAND

This is the hoy

THIN KERF



only $3\frac{1}{4}$" kerf

HOY THIN KERF chains are of the well-tried Multipic design and have ample strength for modern 80 h.p. coal-cutting machines but

they cut a kerf of only $3\frac{1}{4}$ ins.

In a thin seam this means a considerably smaller percentage of the coal is produced as kervings and a greater percentage as +2 ins. coal. The smaller gum pile improves face ventilation.

● ASK FOR NEW DESCRIPTIVE BROCHURE ●

AUSTIN HOY
AND COMPANY LIMITED
STATION WORKS · SAUNDERTON
HIGH WYCOMBE · BUCKS
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coal cutter chain

T.K.I.

More than 1,000 International BTD-20's are earning profit around the world—proved performance and reliability make it the best buy in its size category.

BTD-20 power and matched equipment –reliable profit-earners everywhere

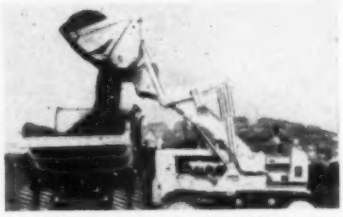
The BTD-20 Crawler Tractor is powered by a six-cylinder diesel and features all-weather push-button starting as regular equipment. On-the-job reports prove that its direct injection efficiency offers big fuel savings: typical 'dozer job averaging 3½ gallons an hour. BTD-20 gear-drive efficiency converts 124 flywheel horsepower into 104 draw-bar horsepower. Six-speed transmission, forward and reverse, gives operator right speed for any job (three heavy-work gears under 2½ miles per hour); each reverse speed 25% higher than the same forward gear. Progressive gear shift enables operator to select any speed, forward or reverse, in a fraction of a second. *BTD-20 puts more work passes into every hour.* Your International Construction Equipment distributor will demonstrate the BTD-20 in action on your job. *Call him today.*

INTERNATIONAL
CONSTRUCTION EQUIPMENT
the finest on tyres and tracks

INTERNATIONAL HARVESTER COMPANY OF GREAT BRITAIN LIMITED, HARVESTER HOUSE, 259 CITY ROAD, LONDON EC1

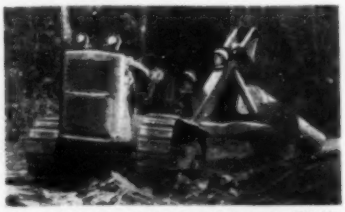
SOLD AND SERVICED BY

JAMES BOWEN & SONS LTD Edinburgh, Glasgow, Aberdeen
R. CRIPPS & CO LTD Nottingham, Manchester, Shildon
SAVILLE (TRACTORS) LTD London, Stratford-on-Avon, Exeter, Salisbury, Cardiff, Belfast



You get 'dozer, scraper, skid-shovel and clamshell in big 3 cubic yard size with one B-20K-3 International Drott 4-in-1—and no sticky bucket problem!

Right speed for each job! BTD-20's first three work-gears all give in excess of 103 d.b.h.p. Instant speed selection from BTD-20's progressive shift pattern.



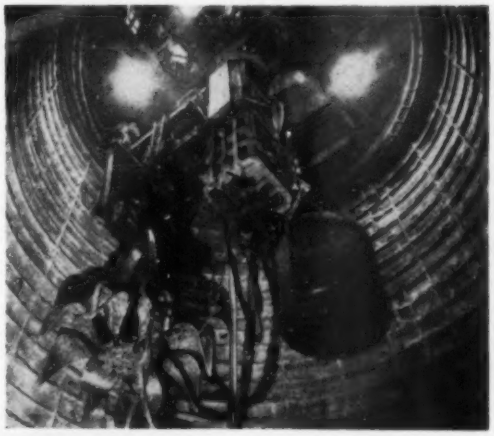
Tough track components and undercarriage. BTD-20's exclusive three-point track suspension will maintain alignment and extend track life.

THYSSEN

SHAFT SINKING COMPANY LTD.

MINING AND CIVIL ENGINEERING CONTRACTORS
MINING CONSULTANTS

View from the Shaft Bottom, showing the underside of the Sinking Stage, 105 cubic feet capacity bowk and lashing gear, including grab and driver's cabin, etc., in use at Kellingley Colliery, Yorkshire, where we established the British Shaft Sinking Record of 339ft. of completed 24ft. internal diameter concrete lined shaft in January, 1961.



View of the Roadway at Blaengwrach (New Drift), South Wales where, in cross measure coal strata, we established the British Tunnelling Record of 108 yards advance in one week during February, 1961.

(Photographs by courtesy of the National Coal Board)

SHAFT SINKING, TUNNELLING, CEMENTATION, SPECIALISTS IN ALL TYPES OF UNDERGROUND DEVELOPMENT WORK

ALL TYPES OF CIVIL ENGINEERING WORK

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Telephone: Llanelly 3594/Pontyates 357/8/9.

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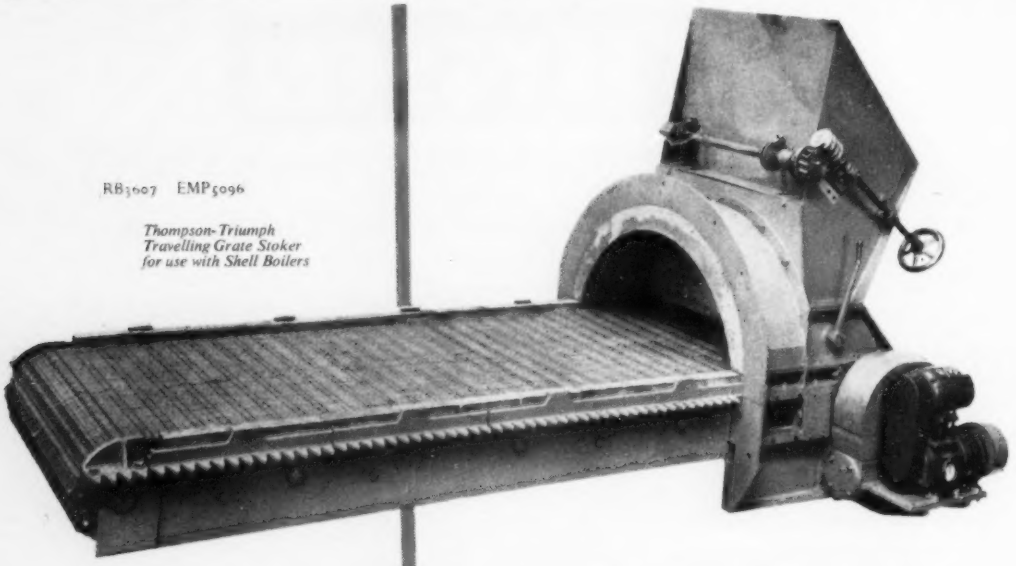
RB3007 EMP5096

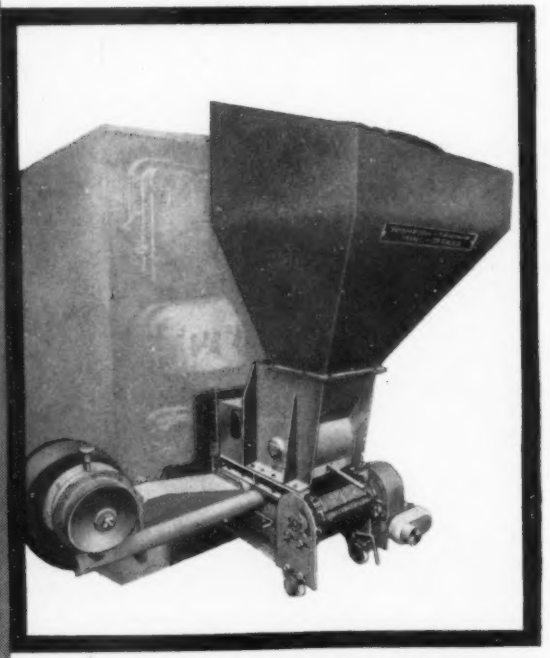
Thompson-Triumph Travelling Grate Stoker for use with Shell Boilers



SOLID FUEL *FIRING*

These two stokers have been designed to meet all the requirements of the Clean Air Act. They burn a wide range of low grade fuels, *economically*. Over 130 years experience of the design and manufacture of combustion equipment is supporting these stokers and we will be pleased to discuss your firing problems at all times.

THESE STOKERS CAN BE SEEN AT THE FUEL AND POWER FOR INDUSTRY EXHIBITION, QUEENS HALL, LEEDS, 18—27 OCT 1961.



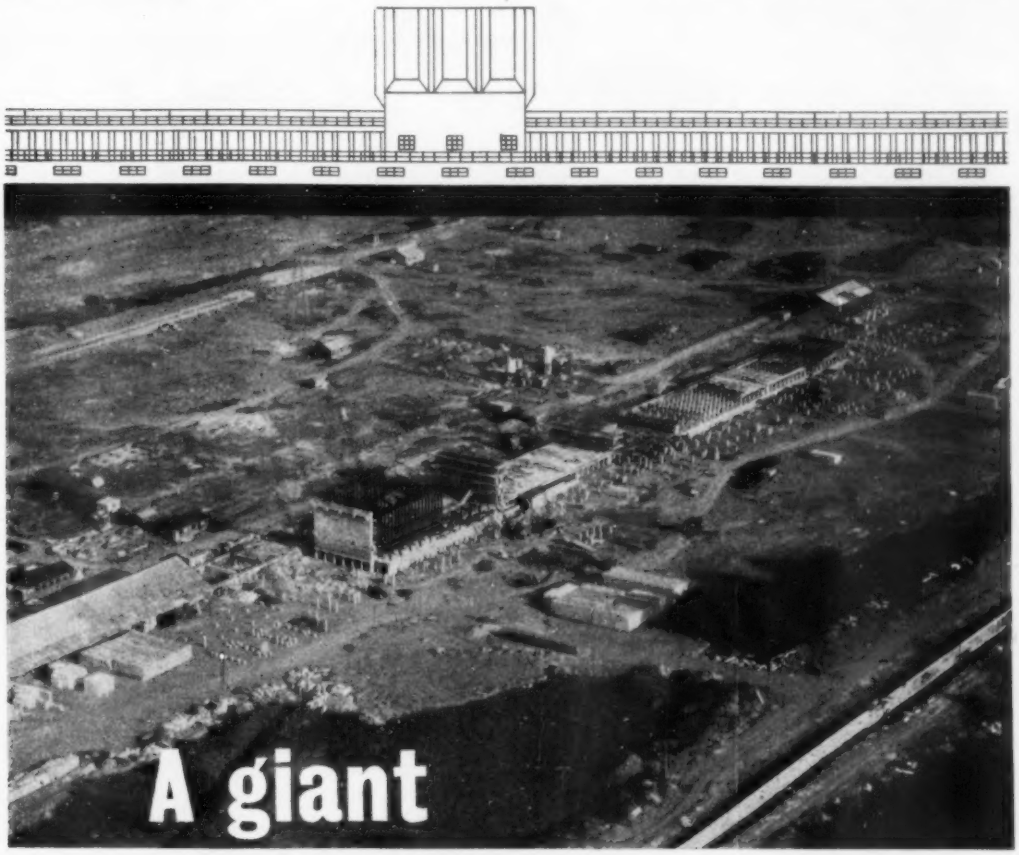
Thompson-Triumph Mini Stoker for use on a wide range of sectional heating boilers

JOHN THOMPSON GROUP

THOMPSON-TRIUMPH STOKERS LIMITED-JOHN THOMPSON

JOHN THOMPSON (TRIUMPH STOKER) LIMITED
KIRKSTALL ROAD · LEEDS 3

TP/8



emerges

. . . . a giant whose job it will be to serve
an even bigger giant faithfully and regularly for a great many years.
The scene is a greenfield site in Newport, Monmouthshire
and the works under construction are the 140-oven coke oven and by-product plants
we are building for Richard Thomas & Baldwins Ltd.
The plant will supply coke to the new blast furnaces at Spencer Works
and is to go into production in September.
This is one of the largest coke oven contracts placed in Britain for some years.

STEELWORKS COKING PLANTS BY

Simon-Carves Ltd

STOCKPORT, ENGLAND

MEMBER COMPANY
SIMON ENGINEERING LTD

and at CALCUTTA · JOHANNESBURG · SYDNEY · TORONTO

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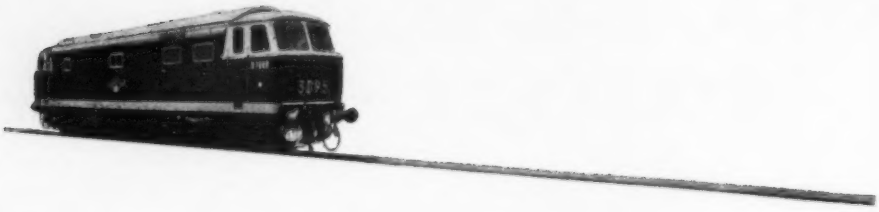
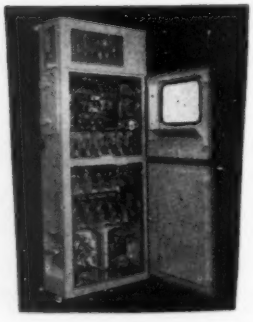
BRUSH

CONTROL EQUIPMENT

FOR 95 DIESEL HYDRAULIC LOCO'S



The 95 new Type 3 1,700 h.p. Diesel Hydraulic Locomotives now being supplied by Beyer Peacock (Hymek) Ltd. for the Western Region of British Railways are being equipped with control equipment and dynostarters by Brush Electrical Engineering Co. Ltd.
The major part of the control equipment is located in a compact cubicle at the rear of the driving cab, and is designed to ensure automatically the correct starting and engine running conditions. Principle feature of the driver's desk is the master controller with handles designed for maximum comfort and smart appearance.



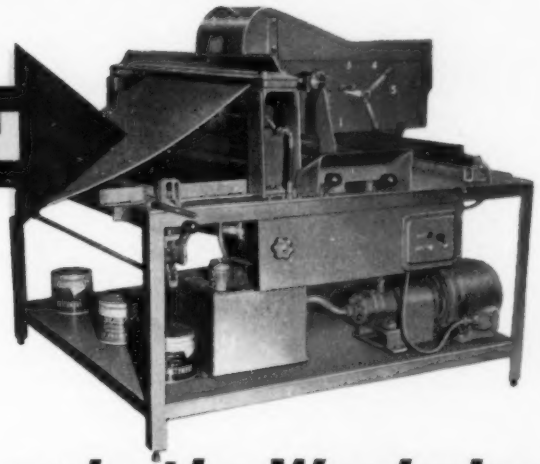
BRUSH ELECTRICAL ENGINEERING COMPANY LIMITED

A Member of Hawker Siddeley Industries

Loughborough, England

Comet LEVIATHAN

BELT FASTENING BY NUMBERS



Hydraulic Belt lacing Equipment on the face.. ..or in the Workshop

Photograph by courtesy of The National Coal Board

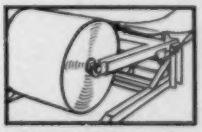
Ease, Speed and Simplicity of operation Belt-end is securely, mechanically held; ensuring perfect alignment of hooks. Hydraulically-operated jaws (adjustable to thickness of belting) ensure perfect clench. A 42" belt takes 5 minutes to joint.... calls for *no* effort!

Mechanically Perfect Joint As the hooks are always absolutely in line, and every hook correctly clenched, it is impossible to make anything *but* a perfect joint—which *must* last longer!

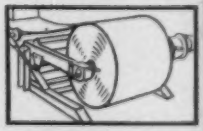
Wide Range 'Leviathan' is versatile. Takes any belt-width from 16" to 48". Any thickness of belt from $\frac{1}{4}$" to $\frac{3}{8}$". You can operate the 'Leviathan' a full working week without wasting a single hook!

Eliminates Operator Fatigue Leviathan provides *all* the power needed. The operator only controls it, and is still working as efficiently at the end of the day as during his peak period. Full utilization of machine, lower cost per joint *must* follow.

Complementary Equipment



UNCOILING HEAD Hydraulically operated to lift coil clear of ground.



COILING HEAD Electrically operated, re-coils belting after joint is made.

Every responsible colliery executive will naturally be interested in this latest development and is cordially invited to see it demonstrated at our factory.

Comet

COLLIERY CONVEYOR BELT LACING SYSTEM

MASTABAR MINING EQUIPMENT COMPANY LTD.

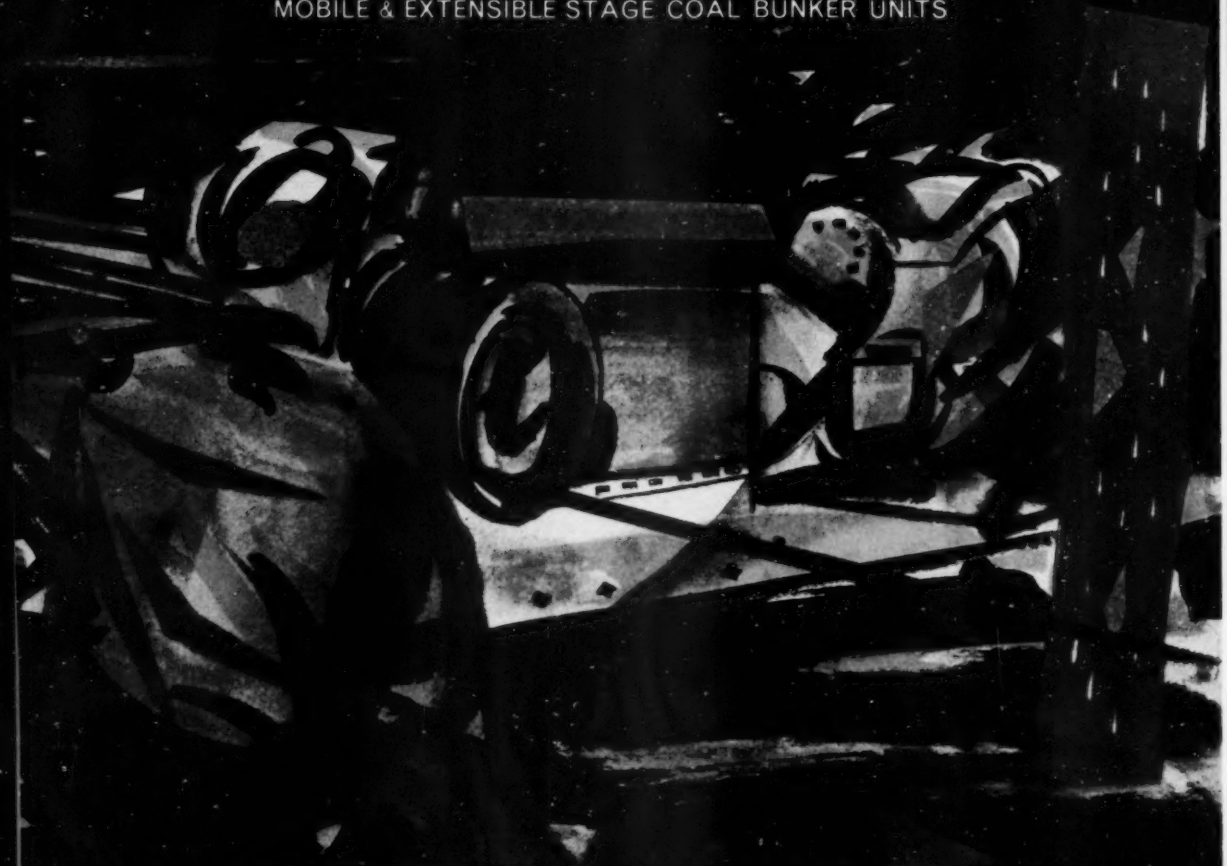
AVENUE PARADE · ACCRINGTON · LANCS. · TEL: 35411 (3 lines).
AND AT CARDIFF · LONDON · NOTTINGHAM · LEEDS · NEWCASTLE-UPON-TYNE

CRAWLEY

MINING EQUIPMENT

Crawley thin seam mining equipment includes:—

CRAWLEY-WILCOX CONTINUOUS MINERS · MOBILE BUNKER CONVEYORS
CRAWLEY MIDGET MINERS · MOBILE STAGE LOADERS
LO-HITE ARMOURED SNAKING CONVEYORS · MOBILE STAGE FEEDERS
HEAVY DUTY SNAKING CONVEYORS · EXTENSIBLE STAGE LOADERS
STATIONARY BUNKER CONVEYORS · EXTENSIBLE TUB LOADERS
MOBILE & EXTENSIBLE STAGE COAL BUNKER UNITS



Write for **CRAWLEY** *"Mining Equipment" Catalogue NOW!*

THE CRAWLEY HEAVY DUTY ARMOURED SNAKING CONVEYOR

HEAVY DUTY
Lo-Hite Armoured Snaking Conveyor
Capacity—120 tons/hour

Length up to 180 yards according to h.p. and gradient. Power rating of 40-100 h.p. dependent on the number of standard units to be fitted which may vary from 1 to 2. A typical installation at a British Colliery has been operating successfully on an 180 yds. face with a single 40 h.p. unit, on a gradient of 1 in 9 against the load, and handling without interruption the output from a power-loading machine.

C.6 Lo-hite Armoured Conveyor, double strand 13 or 14 mm. chain :

Width 24½ in. . . Height 6 in.
Width 21½ in. . . Height 6 in.

C.5 Lo-hite Conveyor, double strand 13 or 14 mm. chain :

Width 24½ in. . . Height 5⅛ in.
Width 20½ in. . . Height 5⅛ in.
Width 16½ in. . . Height 5⅛ in.

Capacity—200 tons/hour

Length up to 400 yds., according to h.p. and gradient. Power rating of 40-200 h.p. dependent on the number of standard units fitted which may vary from 1 to 4.

A typical installation at a British Colliery is currently handling 1,000 tons per shift.

C.7 Extra heavy duty Armoured Conveyor, treble strand 18-mm. chain :
Width 36$\frac{5}{16}$ in. . . . Height 7⅛ in.
Width 30⅜ in. . . . Height 7⅛ in.

C.7 Heavy duty Armoured Conveyor, double-strand 8-mm. chain :
Width 24½ in. . . . Height 7⅛ in.
Width 21½ in. . . . Height 7⅛ in.

HIGH CAPACITY
RUGGED CONSTRUCTION
LOW MAINTENANCE COST

Maximum degree of snake to ensure moving over in the shortest distance, together with a high degree of lateral flexibility for undulating gradients. Alloy steel sprockets, giving long trouble free service. Various types of spill plates available to suit operating conditions. Special patented sectionalised pans for insertion at intervals in the conveyor run enable the pan line to be broken for inspection without breaking either top or bottom chain. Chain speed from 114 ft. to 185 ft. per minute to suit individual conditions. All types of conveyors can, at request, be supplied with N.C.B. recommended drive frame and gear boxes.

All Crawley Heavy Duty Machines have the following units standard and interchangeable :

DRIVE FRAME • GEAR BOX • GEAR ASSEMBLIES
EXTENSION SECTIONS • STRUCTURE • TAIL UNIT
CHAIN FLIGHTS

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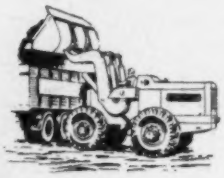
CRAWLEY

THE *International* HOUGH PAYLOADER

Well-known throughout the world and now available in Great Britain, is the HOUGH PAYLOADER Tractor Shovel. With a 2 cu. yd. rated payload and 105 h.p. Leyland UE375 engine, driving through a torque converter and the exclusive 3-speed-range "Paylomatic" power transmission, the new BH-70 offers these outstanding features: Longer wheelbase for maximam stability; unique curved design of the lifting arms providing exceptional operator safety, unimpaired vision and a 9′ 0″ discharge height. Exceptionally powerful pry-out is achieved by use of reverse bucket cylinder action and skid-shoes. Full details and complete specification will be supplied on request.



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CRIPPS

for Construction Equipment—the finest on tyres and tracks!

R. CRIPPS & COMPANY LIMITED (Established 1891)

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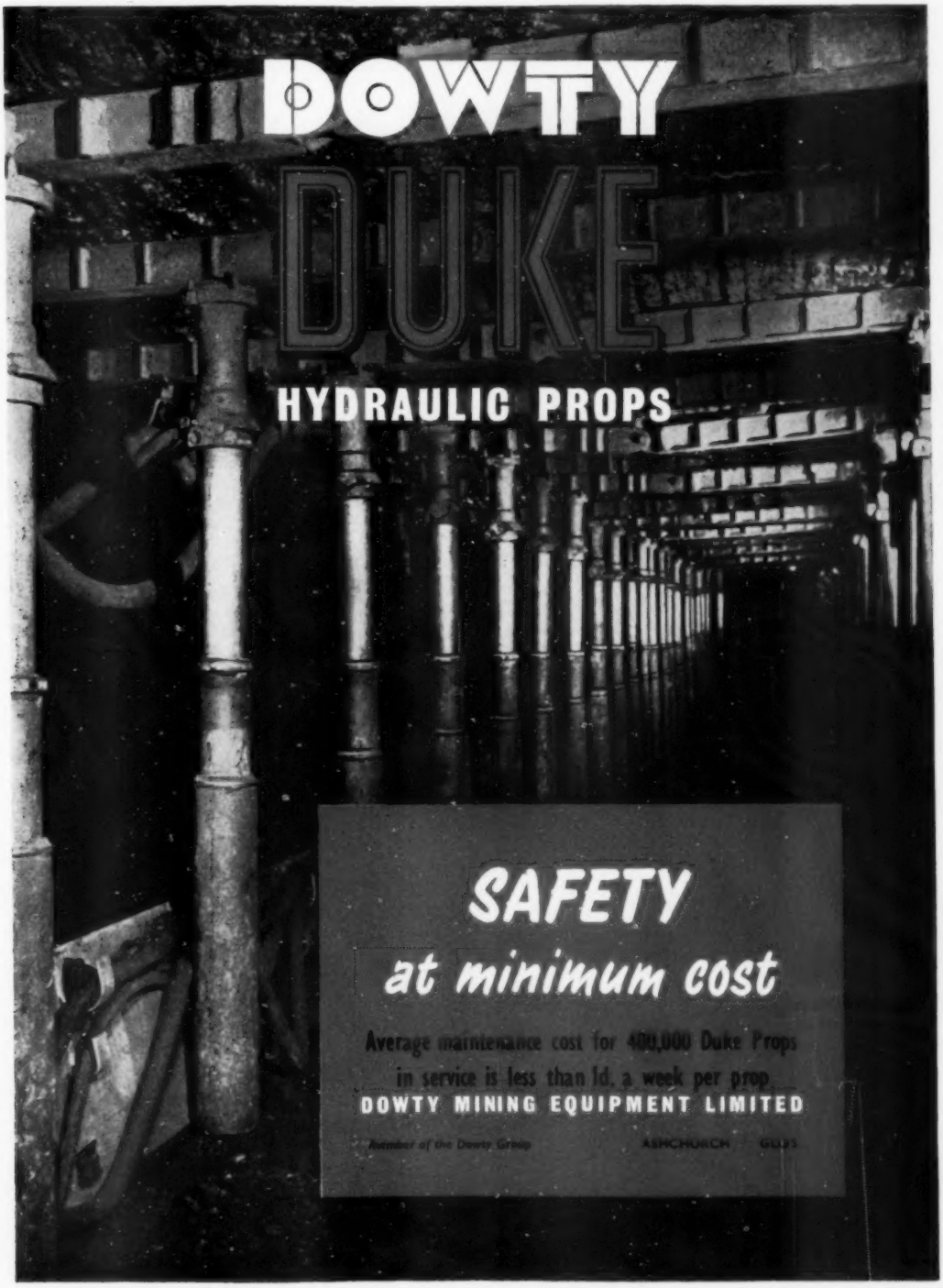
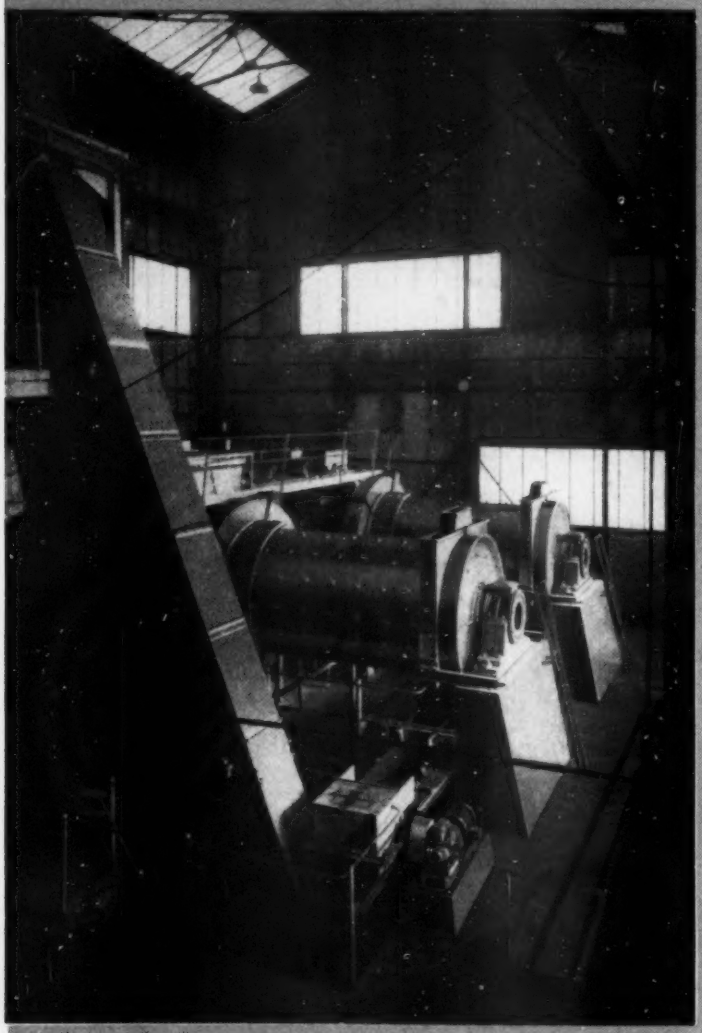

DOWTY
DUKE
HYDRAULIC PROPS
SAFETY
at minimum cost
Average maintenance cost for 400,000 Duke Props
in service is less than 1d. a week per prop
DOWTY MINING EQUIPMENT LIMITED
A member of the Dowty Group
ASHCHURCH GL53

RAW MATERIAL PREPARATION PLANTS FOR STEELWORKS.



Exclusive Design

PATENTED ROD MILLS PRODUCING FINE CRUSHED COKE.

INSTALLED IN LEADING BRITISH AND CONTINENTAL STEELWORKS.

OTHER EQUIPMENT SPECIALLY DESIGNED FOR STEEL WORKS:—

- PATENTED ROTATING DRUM & SCROLL MIXERS.
- HEAVY DUTY TABLE & APRON FEEDERS.
- ORE CRUSHING AND GRADING PLANTS.
- PLANTS FOR PRODUCING BASIC SLAG.
- LIMESTONE CRUSHING & SCREENING PLANTS.

FOR WELL OVER 25 YEARS NEWELLS HAVE SUPPLIED 80 INSTALLATIONS SIMILAR TO THE ABOVE TO LEADING STEEL MANUFACTURERS AND COAL OVENS AT HOME AND ABROAD, MANY OF WHICH ARE REPEAT ORDERS. MANUFACTURING EXPERIENCE COUPLED WITH HIGH QUALITY WORKMANSHIP ENSURES FULL WORKING SATISFACTION.

Newells

ERNEST NEWELL & COMPANY LTD.
MISTERTON VIA DONCASTER, ENGLAND.

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'Top' all supports & support all 'tops'

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REF. No. TCR/FA/236

PRIEST

INGOT SOAKING PITS

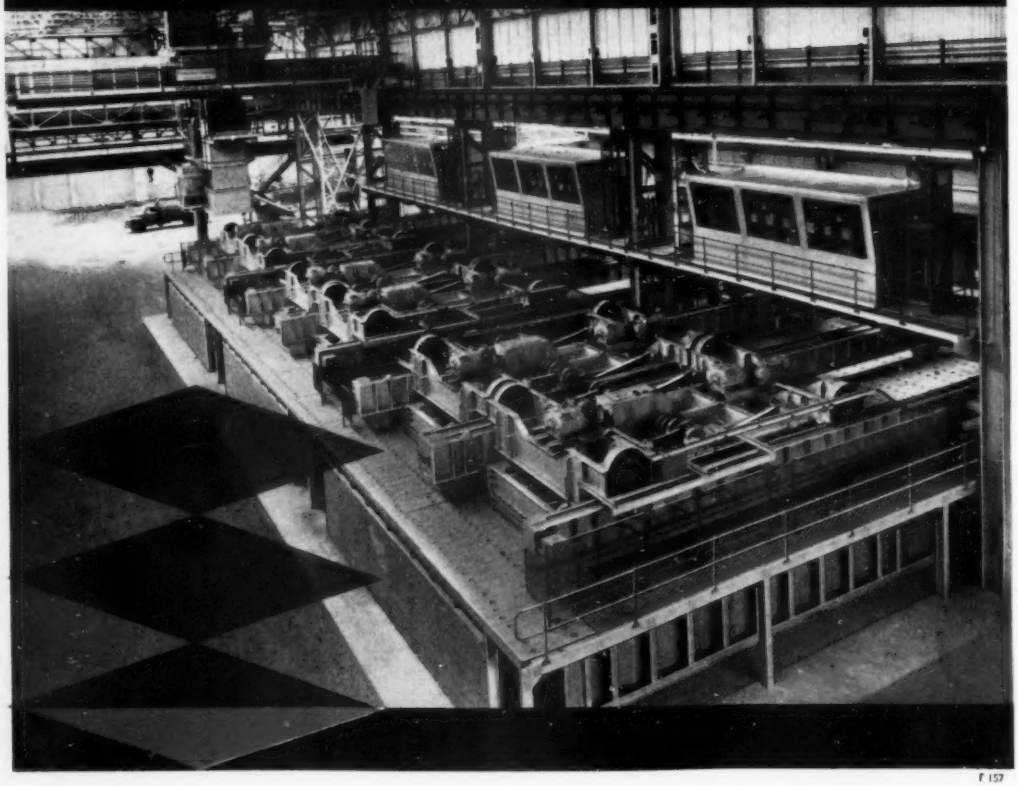
The illustration below is of a battery of six One-way Oil-Fired Soaking Pits installed at Hallside Works of The Clyde Alloy Steel Company Limited.

Each cell is complete with its own cover operating machine, combustion equipment and automatic controls; one single recuperator and stack serves twin cells.

We specialise in the design and construction of:

Open Hearth Furnaces
Soaking Pits of all types
Continuous Multi-zone Bloom and Slab Re-heating Furnaces
Continuous Bogie type Ingot and Slab Heating Furnaces
Furnaces for Aluminium Melting, Coil Annealing and Slab Re-heating
Forge and Heat Treatment Furnaces
Stress Relieving Furnaces
Shipyard Plate and Bar Furnaces
Modern Lime Burning Kilns

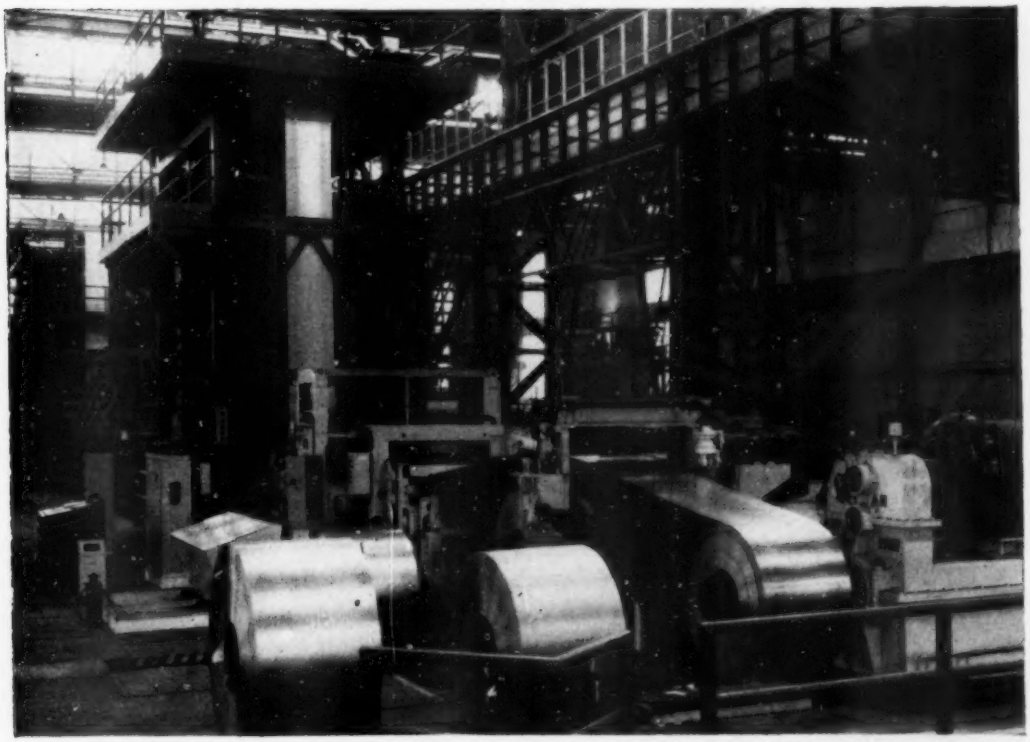
PRIEST FURNACES LIMITED · LONGLANDS · MIDDLESBROUGH also at KELHAM ISLAND WORKS · SHEFFIELD 3



F 157

Another Electrolytic Tinning Line for Britain

The sixth Ferrostan electrolytic tinning line of Wean design to be installed in a British steelworks has now been commissioned for operation at the Trostre Works of The Steel Company of Wales Ltd.



WEAN-MILES LTD., designers and builders of equipment for British sheet and tinplate mills, are at present completing the engineering, manufacture and installation of new lines for:—

CONTINUOUS TINPLATE ANNEALING · CONTINUOUS STRIP PICKLING
SHEET SHEARING · SHEET SLITTING · TINPLATE INSPECTION

All this equipment is engineered and built to the designs developed by Wean, and incorporates specialized units of British design. British manufacturing facilities, labour and skill are employed throughout.

Wean-designed pickling, electrolytic cleaning, annealing, tinning, galvanizing and shearing equipment is extensively used throughout the world for processing and finishing tinplate and sheet-mill products, including stainless and silicon steels.

Their experience gained from close co-operation with the steel industries of the world for over 30 years is embodied in the equipment built in Britain by Wean-Miles Ltd.

WEAN-MILES LTD.

MOOR HOUSE · LONDON E.C.2.

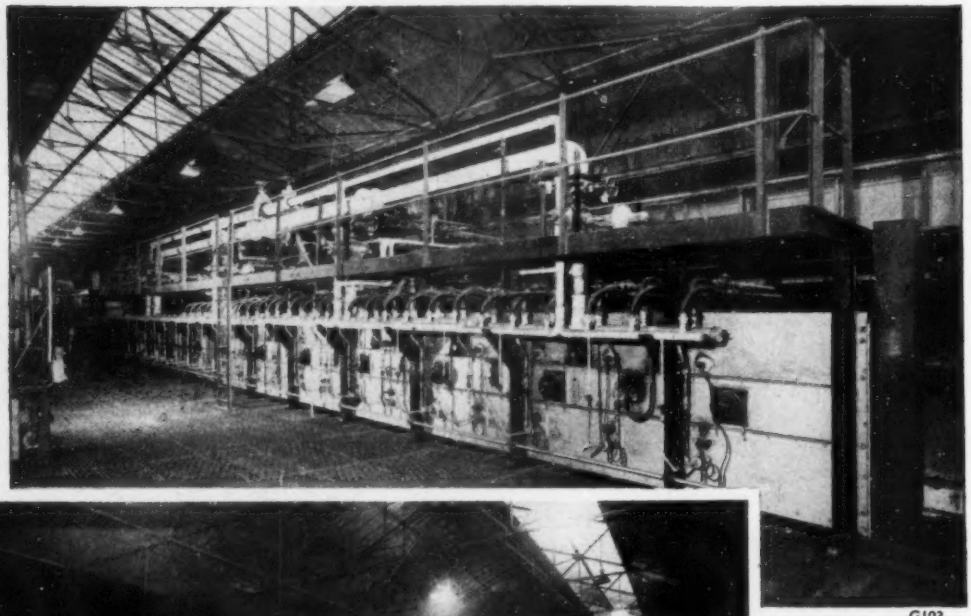
Telephone:- Metropolitan 0471 ***Cable:-Weanmil London***

3

GIBBONS

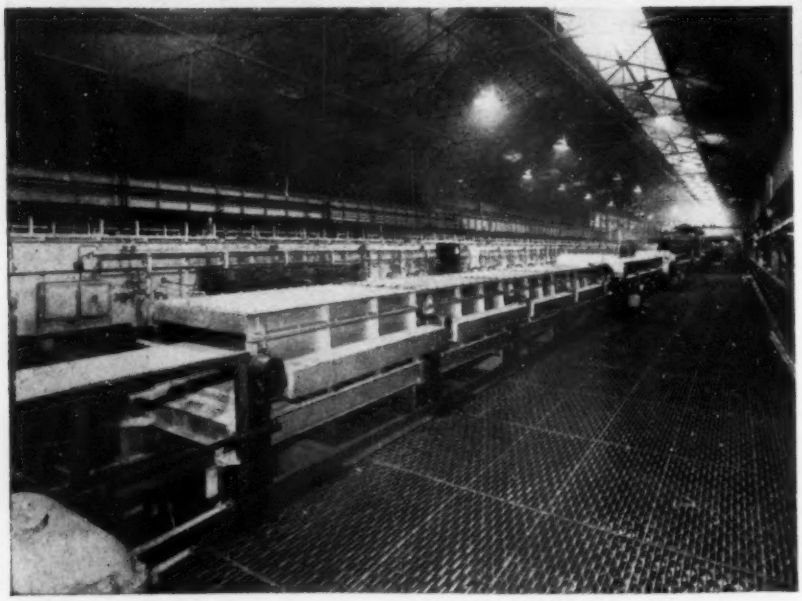
GAS FIRED 'ALCORLIN LINE' FURNACE

for the continuous drying and cooling of Alcorlin coated silicon steel strip



G103

GB



View of —
Water Cooling Section

Photographs by kind permission of—
Messrs. Richard Thomas & Baldwins Ltd., Midland Section

GIBBONS BROTHERS LTD., DUDLEY, WORCESTERSHIRE

ROUGH TOUGH HANDLING...

Rough, tough handling — that's the way they treat 'em in Rugby League.
There's no quarter given, and none asked,
but this does not deter stars like Great Britain's John Whiteley
from giving consistent, top-class performance.

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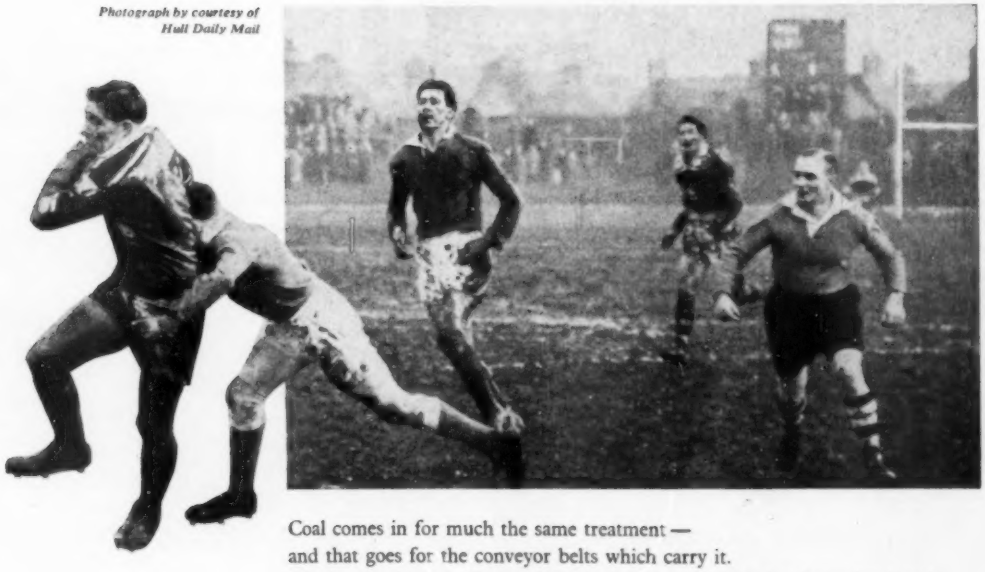

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to stand up to the never-ending scrimmages of colliery life:
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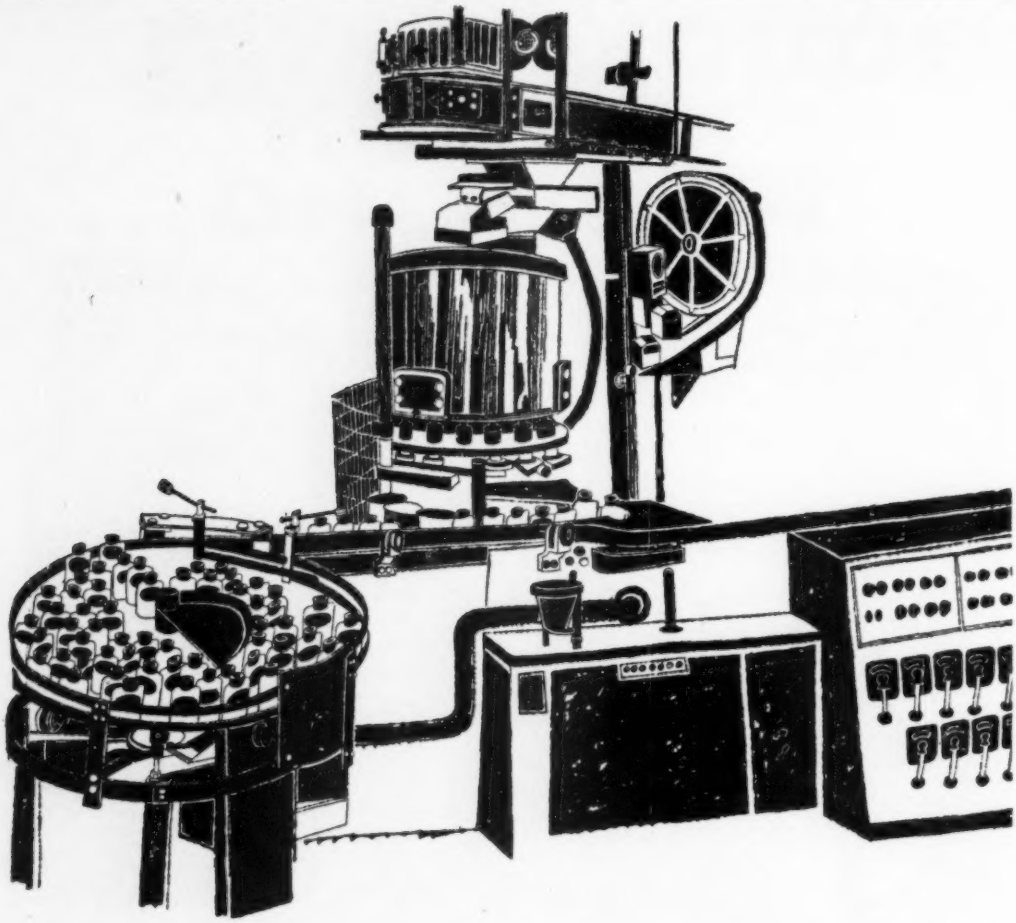

THE MONEY THAT MANAGEMENTS SAVE THROUGH MOBIL ECONOMY SERVICE

More than £3,000 saved in a year at Reckitt & Sons Ltd

RECKITT AND SONS LTD of Hull, asked Mobil to suggest improvements in the maintenance and lubrication systems at four of their factories. Mobil advised using a card index system to ensure regular and correct lubrication, reducing the number of oils stocked, reclamation of used oil, and several other schemes of preventive maintenance and purchasing rationalisation.

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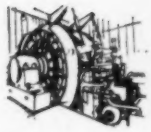

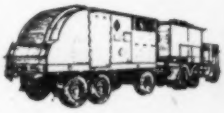

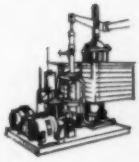

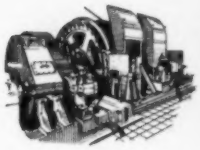

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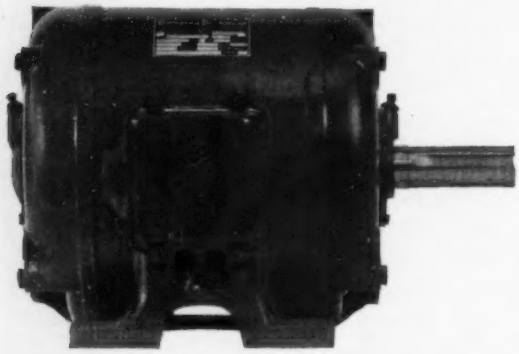

You can usually divide the designing of any piece of equipment into two parts. The first—mainly theoretical—determining the basis of performance; the second—mainly practical—concerned with how the thing shall be made. Whereas the first proceeds from well-established principles held in common by all engineers, the second draws largely on the experience which has been accumulated over the years by a single manufacturer: his know-how. It is usually on this second aspect of design that the differences between one manufacturer's product and another's depends.

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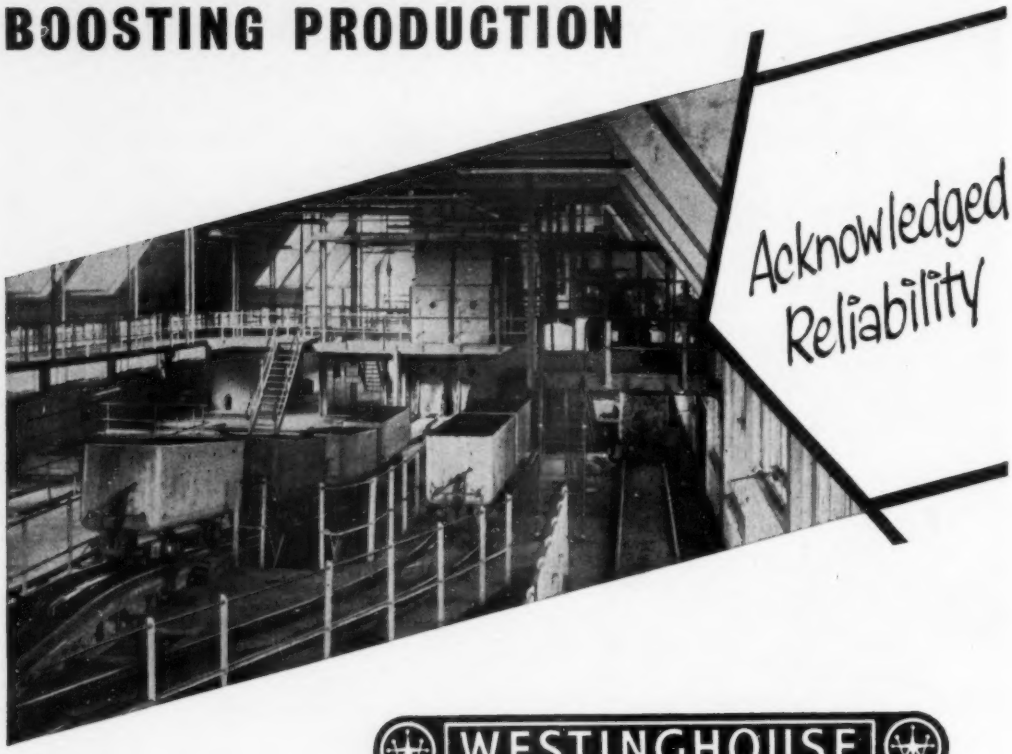

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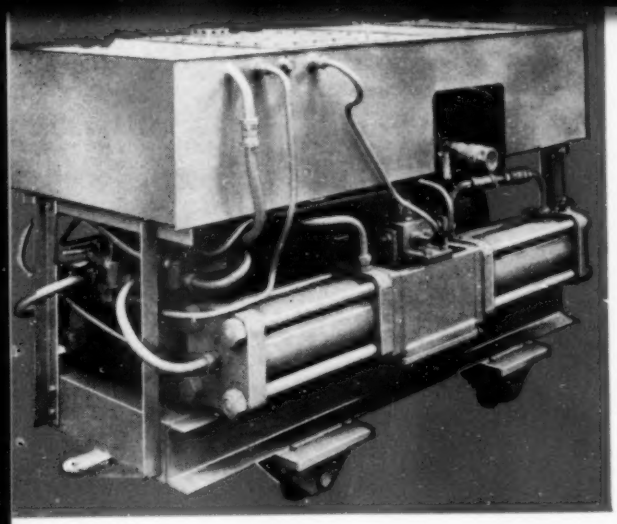

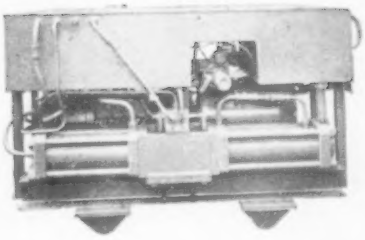

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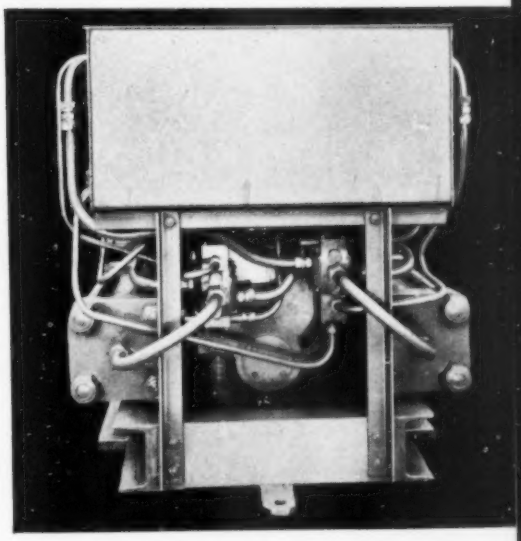

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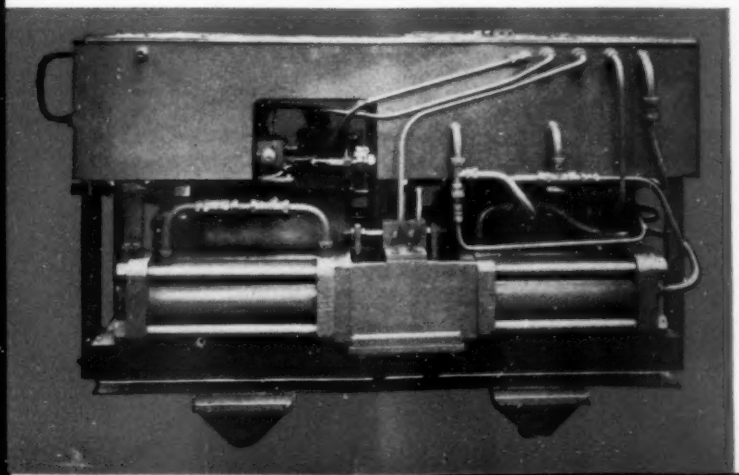

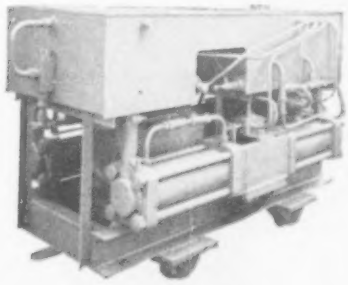

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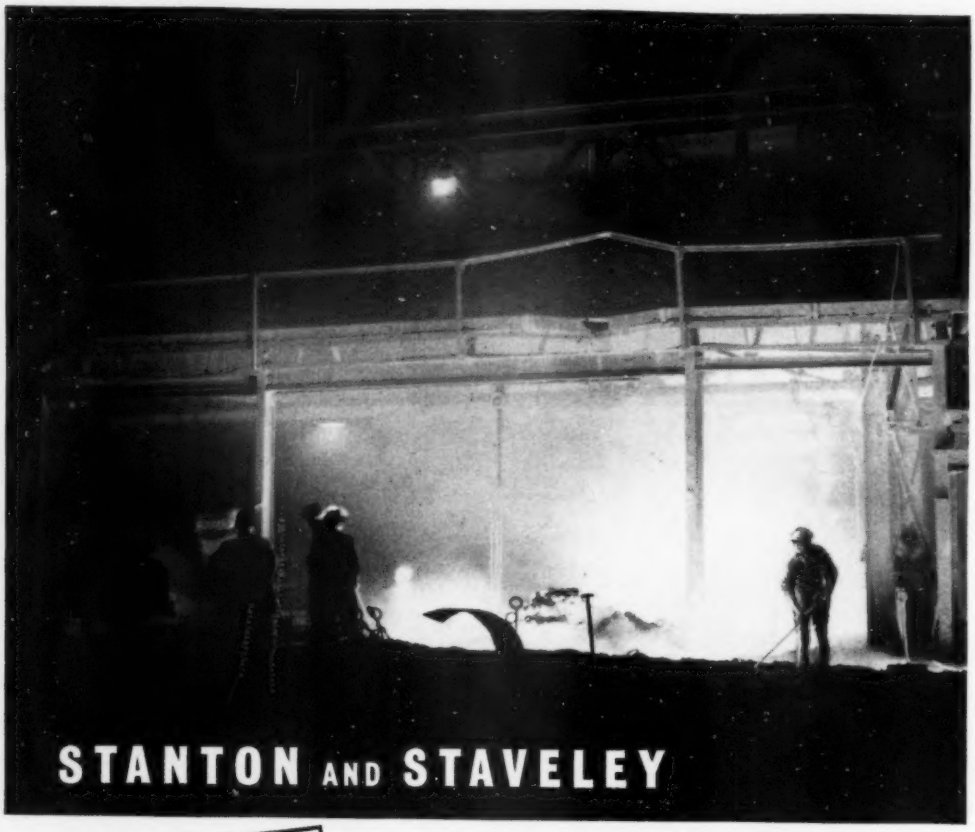

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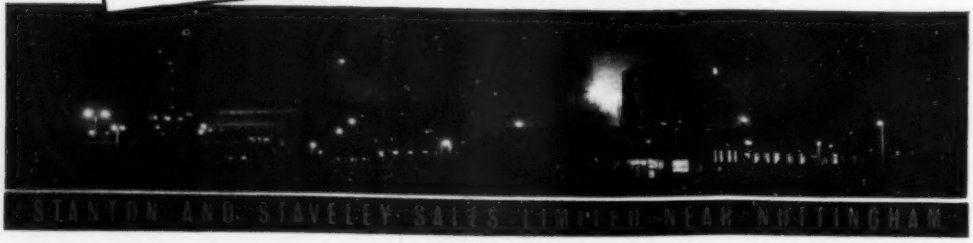

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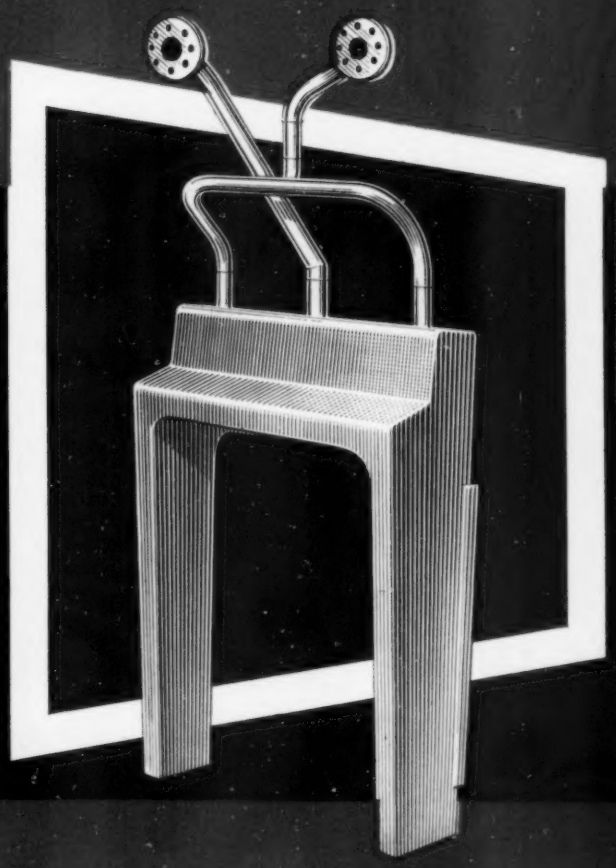

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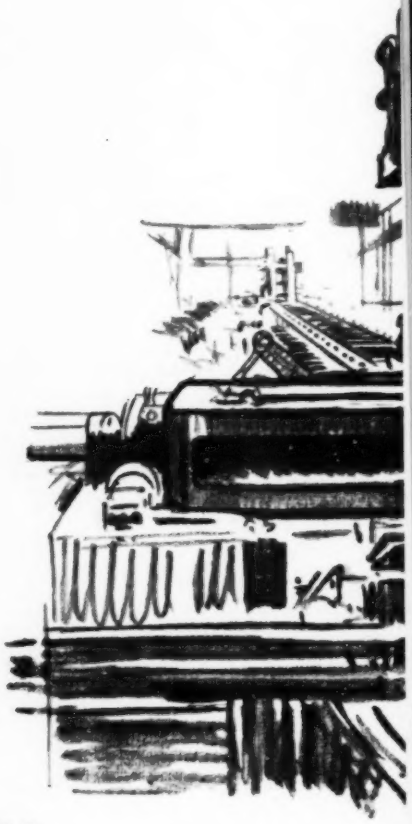

LANARKSHIRE'S UNIVERSAL BEAM MILL IS NOW IN OPERATION

The installation work on Lanarkshire's Universal Beam Mill at Motherwell, Scotland's steel town, is now complete. This Mill will roll Universal Beams with parallel flanges and Universal Columns in accordance with BS 4B 1959.

BEAMS From 8" x 5¼" to 24" x 9"
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Trial rollings are now in progress and very soon Universal Beams and Columns bearing the familiar brand 'The Lanarkshire Steel Co. Ltd.' will be freely available.

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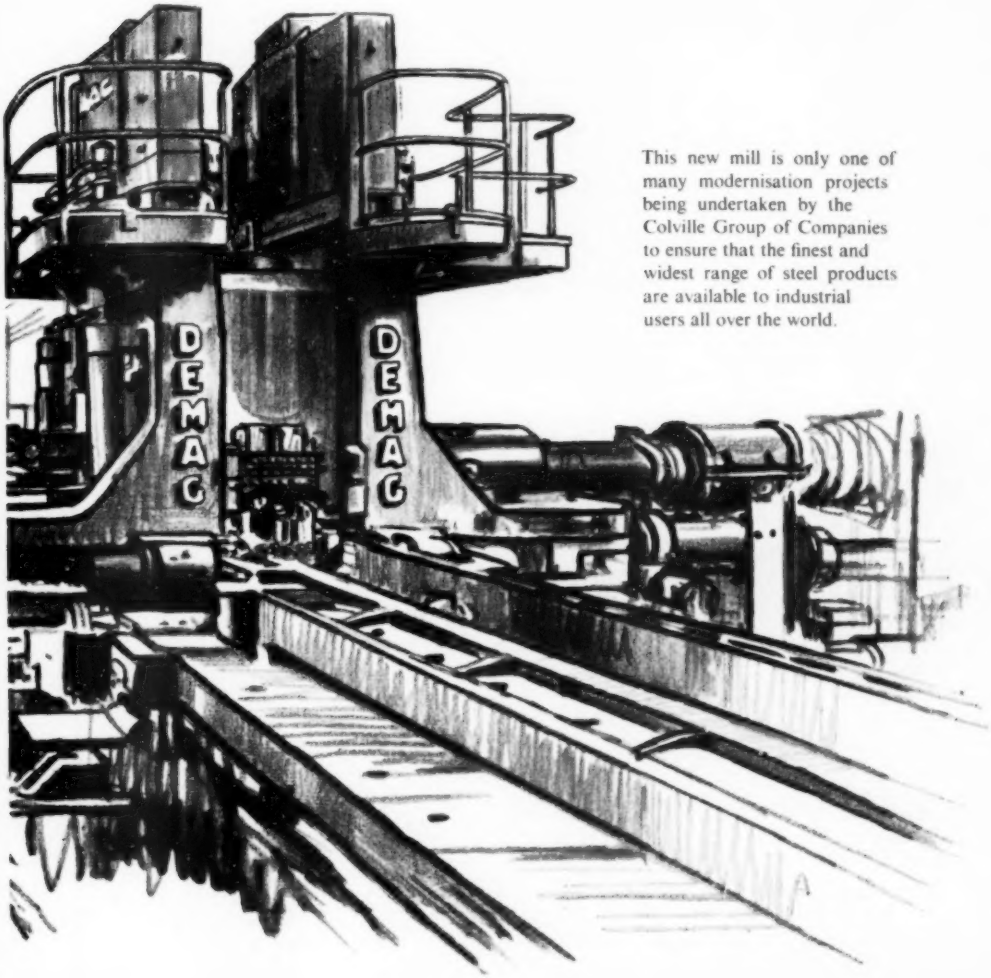

This new mill is only one of many modernisation projects being undertaken by the Colville Group of Companies to ensure that the finest and widest range of steel products are available to industrial users all over the world.

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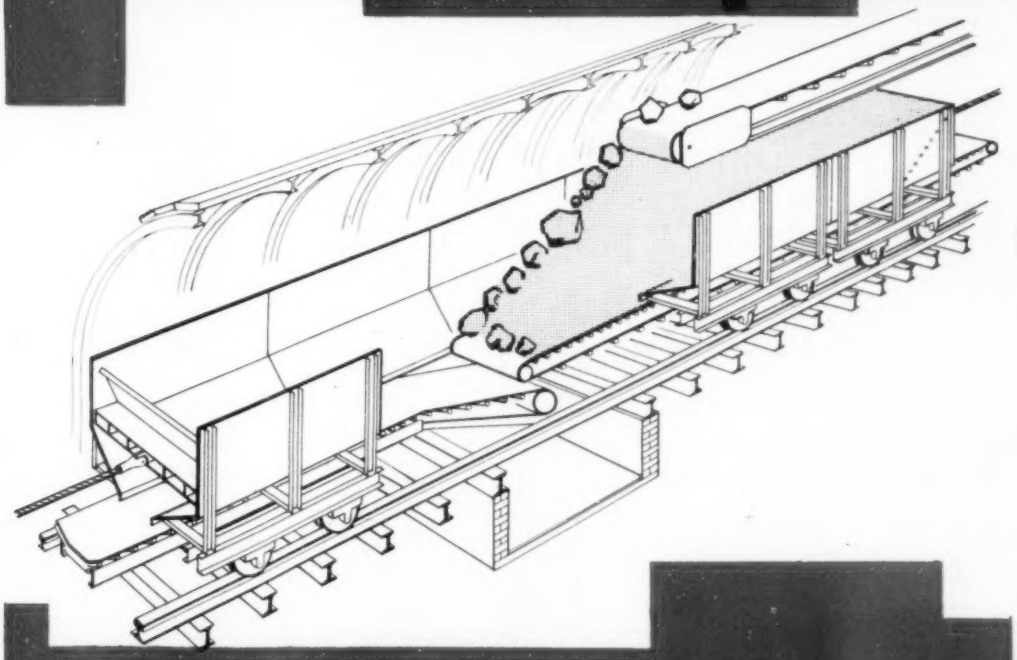

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Vol. 183
No. 4863

IRON & COAL
THE IRON AND COAL TRADES REVIEW

SEPTEMBER 29, 1961

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IRON & COAL
THE IRON AND COAL TRADES REVIEW

Vol. 183 September 29, 1961 No. 4,863

House Coal Signal at Danger

STATISTICS compiled by the Ministry of Power show that on September 16 merchants had in stock for domestic use 1,609,000 tons of house coal and 240,000 tons of anthracite and boiler fuel. The figures show a great improvement on the position a year earlier, when house-coal stocks were 1,270,000 tons and anthracite and boiler fuel stocks were 188,000 tons. Measured in terms of winter consumption, merchants now have in hand 2.1 weeks' reserves of house coal and 4.0 weeks' reserves of boiler fuel, compared with 1.7 weeks and 3.1 weeks a year ago. But this is not the whole story. Although merchants' stocks are higher than they were 12 months ago, there is not the same backing of colliery stocks that existed last year. Given an exceedingly mild winter, the house-coal trade might just scrape through without excessive hardship to householders. With anything like normal winter weather house coal will be in short supply at some time in some parts of the country—probably London and the south. If we have a really hard winter there will be a definite shortage of domestic coal supplies.

The position is causing concern to coal merchants and the National Coal Board, which has had talks with the miners' union to find a solution to the problem. The obvious and only solution is to provide a larger tonnage of house coal in the remaining weeks of the year and throughout the winter. The situation needs to be tackled now: if and when the shortage is with us it will be too late to do much about it. The NCB view is that about half a million tons more is needed to make the position reasonably secure. That should be the minimum aim. The board and the trade are devoting a great deal of effort and spending a lot of money in popularizing solid fuel for space heating, and at their instigation manufacturers are providing new, attractive, and very efficient appliances in which to burn the fuel. Effort and expenditure are bringing results, and helping to create in the public mind that new "image" of coal that is essential for coal's well-being, if not, indeed, for its survival. It would be a tragedy if all these plans were brought to naught for the lack of a few hundred thousand tons of coal.

This coming winter will be a testing time for the domestic coal trade. If supplies fail, even temporarily, it will be exceedingly difficult to rebuild public confidence in the ability of the industry to meet householders' needs. The extra tonnage must be found, and there are only two ways of providing it: to produce it from our own mines or to bring it in from abroad. To the industry, to have to import coal would be humiliating in the extreme, and humiliation can easily be avoided, for there is no question of the coal not being procurable. Doubtless a little more large coal can be got on present working, and colliery managements have been asked to do whatever they can to step up the output of coal of over 2 in. size, but something more is needed. The answer is extended working at house-coal pits, with Saturday opening of selected collieries and overtime on coal-getting operations at other pits where possible.

This calls for a planned procedure with the specific object of producing more large coal. The need is for an extra tonnage of house coal, not for an overall increase in output. If extended working is adopted, as it seems it will be, total output will, of course, be increased, but the whole conception fails if the increase is not in the grades and sizes required. The industry does not want any more small coal, stocks of which, although lower than they were, are still more than adequate, even embarrassingly so. What it does want, and may soon urgently need, is more coal over 2 in., and to provide it calls for a concerted effort by management and men.

That effort will surely be forthcoming, for without it there is a real risk of householders going short of coal this winter. The public is entitled to be absolved of that risk, and it is a risk that the industry has an obligation and a duty to avoid. If a shortage should eventuate, it is difficult to see how the Coal Board could resist pressure to bring in coal from abroad, for it has a statutory duty to keep the public adequately supplied with fuel.

Powell Duffryn Studies the Common Market

DETAILED study of the likely effect upon the company if Britain joins the Common Market is being made by Powell Duffryn, Limited, the £38,000,000 group which has interests in coal, engineering, oil, timber, heating and air conditioning, and shipping.

At last week's annual meeting in London, Sir Henry Wilson Smith, the chairman, said that while no precise answer had yet been reached, he would guess that the impact would be like "the curate's egg—good and bad in parts."

Passing Thoughts . . .

PROF. M. W. THRING

THE classical methods of the shovel and the ash barrow must be eliminated entirely in the future and we have to reach a stage where coal is not seen by the user, nor is the ash, the one being delivered automatically and burnt, and the other being removed equally automatically and without any dust. . . . Our greatest need in the fuel field at the moment is an expenditure of at least half a million pounds a year for at least 10 years on the research and development of new methods of burning, gasifying, and making metals from coal.—PROF. M. W. THRING, Professor of Fuel Technology, University of Sheffield, writing in the Sheffield Telegraph.

I do not want any more work; my job is hard enough. Extra pay is no incentive when the income-tax collector has a go at you. I feel that any miner who works on Saturdays will only take another day off in mid-week.—Miner at Woolley Colliery (Yorks), asked his opinion of possible Saturday working.

An image, far too widely accepted across the Channel, of a nation thinking and working in terms of the last century, devoid of initiative, inelastic in approach, and encompassed by restrictive price and transport regulations, needs to be dispelled, and a new and truer picture substituted—of wideawake industrialists, controlling an efficient production structure, able and anxious to match new needs with new ideas.—Report of the Export Council for Europe, Further Trading Opportunities in Europe.

It is doubtful if any force is powerful enough to break the hold of tea on British industry.—The Guardian.

For their sakes and for the sake of the nation as a whole, young people must have a training second to none in the world, for Britain, relying for her living on her manufacturing and exporting ability, cannot afford obsolescence in plant equipment or techniques, and least of all in the mentral and physical skills of her people.—MR. W. J. CARRON, president of the AEU, opening the new training centre of the Pressed Steel Company, Limited.

If it works, it's obsolete.—Modern American proverb quoted by LORD MOUNTBATTEN *at a study conference on defence administration.*

Businessmen, upon whom rest in part the hopes of the UK to increase its share of overseas trade, whether the Common Market is joined or not, should be properly trained and qualified. . . . Should we not set up universities of business on the grand scale now needed to which our businessmen of the future can go in their many thousands to be so equipped? Or are we content to soldier on as at present?—Letter in the Financial Times.

*Orders are not deliveries and budgets are not results.—*MR. ROBIN BROOK, *chairman of W. E. Sykes, Limited, machine-tool makers, of Staines (Middx).*

Saturday Shifts at Some Pits

QUALIFIED approval was given by the executive of the National Union of Mineworkers in London on Wednesday to a resumption of the Saturday shift—although on a limited and selective basis. Lord Robens, chairman of the National Coal Board, put the case to the executive, stressing the importance of maintaining adequate supplies of good quality house coal, a point he made later on BBC television.

President of the NUM, Mr. S. Ford, said after the executive meeting that it had been agreed—not unanimously—that pits could be opened on Saturday providing there were local negotiations and on the understanding that the extra work was on a voluntary basis. Each shift would be of six hours and paid at the normal overtime rate of time and a half. No pit was to work more than six Saturdays between now and the end of March. He hoped that when the situation was explained the men would see the wisdom of the executive's decision, as "we regard this to be in the interest of the coal-mining industry."

He went on to say that there was no question of an immediate shortage of house coal. The Saturday shift would be worked only if it became necessary in a particular area and only after discussions between the Area union and the divisional board. The proposal would be put to the men at each pit and, no matter how serious the emergency, they would have the right to reject it.

The voluntary Saturday shift was ended by the board in April, 1958, when there was considerable overproduction of coal.

At a meeting of the South Wales Area executive council of the NUM earlier this week, it was understood that resumption of Saturday working would be opposed.

Inquiry into £20,000,000 Scottish Colliery

FUTURE of Rothes Colliery, Thornton, Fife, which was built at a cost of about £20,000,000 and began production only four years ago, is being considered by experts of the National Coal Board. Lord Robens, chairman of the NCB, has stated this in reply to Mr. W. W. Hamilton, Labour MP for West Fife, who recently wrote to Mr. Richard Wood, Minister of Power, asking for an answer to "persistent reports" that the colliery was to be closed.

Lord Robens, in his reply, said: "The severe geological difficulties which have been encountered there have been causing the board concern for some time. You may, however, be assured that before any action is taken there will be full consultation with the men and with the unions concerned."

THE NEWCASTLE-UPON-TYNE area sales office of Alcan Industries, Limited (formerly Northern Aluminium Company, Limited), will remove to new premises at Newgate House, Newgate Street, Newcastle-upon-Tyne, on Monday. From this address the office, under the management of Mr. N. P. Campbell, will continue to serve the needs of County Durham, Cumberland, Northumberland, Westmorland, and Scotland for all forms of Noral aluminium and aluminium alloy materials. The telephone number is changed to Newcastle-upon-Tyne 22107, but the Telex number, 21917, remains unchanged.

EXPORTING TO EUROPE

More Market Opportunities for UK Firms

WHILE the conditions under which British industry will operate in the various European countries may be altered substantially by the outcome of the present talks with the Common Market, whatever happens the potentialities of the European market for British manufacturers will remain great and should be tackled "energetically and without delay." These points are made by Sir William McFadzean, chairman of the Export Council for Europe, in the council's third Report on trading opportunities for British firms, describing market opportunities in Belgium and Luxembourg, Finland, Greece, Ireland, the Netherlands and Turkey.

Sir William says that one of the main findings of the council is that Europe is a highly sophisticated and discriminating market. "Success will only be achieved by full attention being given to all the well-known but not so well-observed requirements of exporting—close and constant personal contacts, having the goods of the right design and price, selling hard, and delivering on time."

He adds that the British Government, industry, and all concerned must project a far better "image" of Britain. "It is much too widely accepted in Europe that we are living on our traditions. The picture of our traditions being allied to a modernized, highly efficient industry with a progressive outlook and policy has not yet achieved recognition . . . British industry itself, by its actual performance, can do much more than anything else to create this desirable new image."

National Convention

The council's first report, issued in May, entitled Trading Opportunities in Europe (Part One), covered Austria, Denmark, France, Italy, Norway, Portugal, Spain, Sweden, and Switzerland. The second Trading Opportunities in West Germany, was published in June. Referring to these two reports, Sir William says that the response from manufacturers was encouraging and there were many inspiring "success" stories. "The momentum is growing, but the effort is uneven and the volume of exports still too small," he adds. The council plans to hold a national convention at Eastbourne at the end of November as a climax to its first year of operation.

In all the seven European markets considered in the latest report, ranging from low, through medium, to high living standards, there are openings for British firms exporting heavy industrial capital goods, but it is stressed that attention to price, design, and delivery, and consideration of credit conditions where these apply, may make the difference between sales and disappointment. In Holland, where the standard of living is rising still, demand for machine tools is so great that Dutch firms are buying from Eastern Europe, notwithstanding frequently inferior quality and a deficient after-sales service. There are promising openings there for all types of other capital goods, particularly foundry equipment, electrical machinery, electronic, and weighing and measuring equipment.

Belgium's large-scale industrial re-equipment programme offers openings for Britain, provided delivery times can at least match those of West Germany. Belgium's large power plant programme provides undoubted scope for increased exports. For electrical equipment, it is essential to arrange for built-in transformers for the three voltages of 110, 130, and 220 used in BLEU (Belgo-Luxembourg Economic Union). Current re-equipment plans offer opportunities for the sale of more machine tools, mechanized handling equipment, packaging machinery, and technical equipment generally.

In Finland, the ending of the Russian occupation of the Porkkala enclave has left this area substantially underdeveloped. Rapid development is planned and a number of Finnish companies with factories in Helsinki are either transferring them to Porkkala or are extending there. This will involve three new thermal power stations on the south coast of Finland. These may be coal fired, but Russian or Polish coal will not necessarily be bought.

Nearby a new company is developing a local iron-ore mining from undersea deposits in the archipelago, and installing blast furnaces and rolling mills. Rolling mill plant has not yet been ordered. The textile mill of Vilayhtyma Oy is planning a large extension and will spend £250,000 on additional automatic looms.

Capital equipment including agricultural machinery is required in Turkey, where special financial problems may have needlessly discouraged British exports in the past, says the report. In their struggle to modernize their economies, both Greece and Turkey have immediate basic needs, ranging from excavators and road-making machinery to canning and freezing plants, tinplate, and steel.

Greece requires cranes and loading gear for the enlargement of Piraeus harbour and specialized equipment as surveys of mineral deposits disclose prospects of profitable mining. Extensive Greek power station projects will cost over £60,000,000, and tenders will be invited shortly. Requirements include transformers of between 15 and 115 kW, insulators from low to very high tension, metres, special marine cables, diesel generators of 50 B.H.P. and above, fuses, switchgear, and retaining arrestors, together with a substantial amount of service lorries and cars.

Steel requirements are mainly met at present by Benelux, but there is a promising market for alloy steels. The Greek Industrial Development Corporation is seeking British participation in its project to produce between 250,000 and 300,000 tons annually of steel.

In Ireland, says the report, British firms have been losing ground to continental competitors largely because of price differentials. An effort to regain this lead, especially in respect of printing and agricultural machinery and weaving looms, would be well worth while.

The Romans Knew the Answer

"IT is reported that British houses are among the worst heated in the world. That may or may not be true, but at any rate we British are at last beginning to realize that there is nothing particularly praiseworthy about stoically suffering a cold and draughty home during the winter," said Mr. J. Anderton, chairman of the North-Western Divisional Coal Board on Monday.

MR. J. ANDERTON

He was speaking at the opening of a Ryax Warmhouse show house at Upton, Wirral (Ches). "We are in fact agreeing, after all these years, with the Romans who came to this country 2,000 years ago, sampled our weather, and found that central heating was the only answer," Mr. Anderton continued. Since the NCB's Housewarming Plan had been launched about 18 months ago, a total of £1,475,000 had been loaned out and more than 11,000 installations had been completed. In addition there were those who had installed appliances without applying to the NCB for a loan.

The North-west was very proud that it was second only to the vast London and Southern sales region in its response to the plan and it spoke well for the foresight of people in that part of the country. The NCB was expecting that 10 or 12 new solid fuel domestic appliances would be put on the market before next Spring which would take full or partial central heating to modest income groups.

NORTHERN (N&C) NCB APPOINTMENT

AT present Area Staff Manager of the No. 3 (North Northumberland) Area of the Northern (N&C) Divisional Coal Board, Mr. G. C. Bridgen has been appointed secretary of the Division from October 1. He succeeds Mr. R. Littlewood, who has left the board's service. Mr. Bridgen, who is 33, was educated at Eastbourne Grammar School and Birmingham University, where he took a B.A. (Hons.) degree.

After service in the Royal Army Education Corps, he was Assistant District Commissioner in the Degema and Ahoada districts of the Eastern Region of Nigeria. He joined the NCB in 1954 and transferred to the Northern (N&C) Division in 1959.

BIRWELCO, LIMITED, has made an exclusive agreement with Yuba Consolidated Industries, Inc., of Tulsa, Oklahoma, to manufacture and sell Aimco Transair air-cooled heat exchangers in Europe and the British Commonwealth. Birwelco has already received several large contracts for this type of equipment from both the oil and chemical industries. Birwelco is a wholly-owned subsidiary of the GKN group.

New Chairman of West Midlands NCB

IN succession to Mr. H. A. Longden who is to take up the post of deputy chairman and chief executive of the Cementation Company, Limited, on Monday, Mr. John Brass has been appointed chairman of the West Midlands Divisional Coal Board.

Mr. Brass, who is at present production director of the Northern (N&C) Divisional Coal Board, was born at Ardsley, near Barnsley, on October 22, 1908, and was educated at Oundle and Birmingham University, where he took a B.Sc. honours degree in mining. He was a student at Houghton Main Colliery (Yorks), and with the Stanton Ironworks Company, Limited, near Nottingham, before taking up appointments as assistant manager at Grimethorpe Colliery, manager and agent for the Wharncliffe Silkstone Colliery Company, Limited, agent for Manchester Collieries, Limited, and agent and assistant colliery general manager of the Stanton Ironworks.

Since 1947 Mr. Brass has been Area production manager in both No. 2 and No. 1 Areas of the East Midlands Division of the NCB, general manager of No. 2 (Wigan) Area and of No. 1 (Manchester) Area, both in the North-Western Division. He was appointed to his present post in April, 1957.

More Houses to Encourage Mine Recruits

AFTER a visit to the headquarters of the North-Western Division of the National Coal Board in Manchester on Tuesday, Lord Robens, the NCB chairman, said that plans were being made for a housing programme to encourage recruitment to the industry and to help miners who have to be transferred when old pits are closed down. Talks were going on with the local authorities to see what could be arranged, but in places with special housing problems, one of which was Manchester, the board would have to go ahead and build its own houses.

Lord Robens said the board hoped to build about 200 houses in the Moston area of north Manchester for miners employed at Bradford Colliery. On the question of recruitment he said: "It has not been unreasonable. We are getting a reasonable number of young chaps from school."

NEW LEASE OF LIFE FOR DERBYSHIRE PIT

THREATENED with closure for the past eight years, Denby Drury Lowe Colliery, Ripley (Derbyshire), has recently been producing more than 1,000 tons of coal a day and the East Midlands Divisional Coal Board now plans to spend £100,000 on improving amenities for the 600 men employed there. The three main coal seams at the colliery, one of the oldest in Derbyshire, neared exhaustion in 1953, but engineers later found two seams further underground which could profitably be worked.

A 100-ft. shaft, sunk in 1850 and later abandoned, has been renovated and fitted with new winding gear to serve one of the new seams. A tunnel over half a mile long is now being driven to reach the second seam. Improvements at the 122-year-old colliery includes baths, a canteen, and a medical centre.

New Worry for French Coal

CHEAP BRITISH IMPORTS COULD HASTEN DECLINE

ANXIETY of the declining French coal industry is beginning to focus on the possible repercussions of British membership of the European Coal and Steel Community which it is expected will automatically follow on British membership of the Common Market. Britain will in this event have to open her frontiers to imports of ECSC coal, but France is worried at the prospect of massive French imports of relatively cheap British coal. Lord Robens, chairman of the National Coal Board, is seen as eagerly awaiting the prospect of unloading 27,000,000 tons of stocks on to the French market.

French domestic production is now running at about 56,000,000 tons a year, and is due to be reduced to 53,000,000 tons by 1965. France imported 14,000,000 tons from ECSC last year, and there is indeed every chance that she would have to import still more if Britain joined.

There is point in the French argument that its coal industry's wages bill is increased by 93 per cent. in employers' social security contributions which are used partly to pension off redundant miners. It argues that British coal is only cheaper because in Britain such charges are borne by the State, and paid out of general taxation.

Germany's Record Investment

Record level of investment may be reached this year by the German coal industry in its efforts to rationalize, as a means of combating its coal crisis. The annual report of the Ruhr Collieries Association estimates that the industry will invest this year £88,000,000—almost £10,000,000 more than the previous peak in 1958. Programmes from the beginning of this year until 1963 total about £268,000,000.

Two features have marked the rationalization of the industry up to the present time. The closure of 13 pits since 1957 with a capacity of 4,600,000 tons a year, and the proposed closure of a further eight pits, with a capacity of 6,300,000 tons; and the forging ahead with mechanization.

A further measure has been the merging of small pits, and since 1957 18 larger units have been created from what used to be 36 separate pits. During the same period, according to the report, the amount of coal from fully or partially mechanized workings has increased from 37 per cent. to 59 per cent. of total output.

An end is being seen at last by the American coal industry in the depression in its home market, and it is expected that it will not be long before coal's share in the energy supply will not only stop falling, but will actually start to rise again. First reason for this is that the losses which coal has sustained at the hand of oil and gas, against which coal producers have fought as hard as has the Coal Board in Britain, have gone as far as they can, and in some markets coal is recovering lost ground.

Biggest area of expansion, and the principal reason for coal's new optimism, is the electric utility market. The power stations, which last year consumed 175,000,000 tons of coal, are expected to use 245,000,000 tons in 1965 and over 350,000,000 tons by 1975—a development which has its counterpart to a large extent in the UK. This development is due to the fact that coal is now being offered at lower prices than its rival fuels. The massive modernization programme at the mines and greater economy in transportation (such as the development of coal pipelines from the mines direct to the customer) have narrowed the price gap between coal and its competitors. Thus coal's share in the total energy market, which has fallen to about 25 per cent., is expected to rise to around 33 per cent. by 1975.

The US coal industry, however, will still be subject to fluctuations in the economy. In the current year, for example, coal consumption is so far 13 per cent. below the first seven months of 1960, almost entirely due to the low level of operations in the steel industry, coal's second largest market. But as the power stations will gradually account for a growing proportion of coal consumption, these cyclical swings in the economy should be greatly diminished.

Steel, besides the railways, is the only other "captive" market which the oil and gas companies are seeking, but here coal producers are making a determined effort to beat off the attack. Many experiments have been made for injecting oil and gas into blast furnaces, thus dispensing with, or greatly reducing, the need for coke, but a new coal injection system, developed by National Steel, promises success, and the close contacts which exist between the steel and coal companies may help to swing the balance in coal's favour.

The change in the industry's fortunes is not expected overnight, and it may be some years before the tide completely turns. In the meantime the industry is expected to maintain its pressure on the US Administration to prevent excessive competition from oil and gas, and to enact a national fuels policy. While the high days of 1947-48, when the industry's income after taxes totalled $200,000,000 (it had fallen to $21,000,000 in 1958) may never return, the depths of the recession have certainly been reached and the industry is on the mend again.

Shipbuilding Firm Tenders at Below Cost

ORDER for a new ship on a "below cost" tender has recently been booked by John Readhead & Sons, Limited, shipbuilders and engineers, of South Shields, said the chairman and managing director, Mr. Harold Towers, last week. Estimates for further orders based on less-than-cost figures had been sent out.

Mr. Towers, in a television interview, said orders which would result in a financial loss were being accepted to keep as many as possible of the firm's workers in employment at a time when the yard was short of work. Orders of this type, however, could not be accepted indefinitely.

Personal

Mr. Joseph Jones to Retire from West Midlands NCB

OWING to ill health, Mr. Joseph Jones, industrial relations director of the West Midlands Divisional Coal Board, is to retire at the end of October. Born at Pensnett (Staffs), he started work at the age of 13 and for 21 years was at collieries in South Staffordshire, Cannock Chase, and Warwickshire.

He was a deputy at Baggeridge Colliery, near Dudley, for 10 years and later became checkweighman and branch secretary of the Miners' Union. In 1936, he became miners' agent for South Staffordshire and East Worcestershire. In 1942, he was appointed assistant labour director (Midland Region) in the Ministry of Fuel and Power and two years later Regional Labour Director. He became deputy labour director (labour relations) for the West Midlands Division in 1947, and labour director in July, 1950.

For 12 years Mr. Jones was a member of both the rescue and first-aid teams at Baggeridge, he was awarded the St. John Ambulance first-aid medallion in 1924 and recently was appointed a Serving Brother of the Association. He takes a keen interest in civic affairs, is a JP for Staffordshire, and has been a member and twice chairman of the Sedgley Urban District Council since 1934. He was made OBE in the Coronation Honours List.

Mr. HENRY SPENCER, managing director of Richard Thomas & Baldwins, Limited, has cancelled all his engagements for the next month and is to take a rest on medical advice.

Mr. T. G. ROBSON was installed president of the Stoke-on-Trent Association of Engineers by the retiring president, Mr. A. P. Jesshope, at the annual meeting on Saturday.

Works foreman with Joseph Steel & Sons, Limited, spring manufacturers, of Harden, near Bradford, Mr. JOHN W. BREEN was recently presented with the British Empire Medal by the Earl of Scarbrough. Mr. Breen had been 54 years at the works.

After an association lasting half a century with Taskers of Andover (1932), Limited, Mr. SIDNEY CHARLES COLLIS has retired. For the past 31 years he has been a foreman for the company. He joined the company in 1911 when it was the Waterloo Iron Works.

Mr. F. MARK RUSSELL, a director of S. Russell & Sons, Limited, mechanical and structural engineers, of Leicester, has relinquished his position as secretary of the company on his appointment as engineering divisional manager. He is succeeded as secretary by Mr. J. B. FOGGETT.

Mr. F. C. CROSSE, a director of Parkinson Cowan International, Limited, left England last week to make a six-week investigation of markets in the Far East. In Japan he will carry out a market survey reconnaissance for all Parkinson Cowan products covering the gas, liquid, and electrical industrial and domestic fields. Aftewards he is to visit Hongkong, Singapore, and Australia.

Secretary of the North East Coast Institution of Engineers and Shipbuilders, Mr. T. S. NICOL is to retire next January. He will be succeeded by Cmndr. R. F. A. WHATELY, who will become deputy secretary from October and take up office as secretary in February.

Lord Hailsham, Minister for Science, has appointed two new members—Sir WILLIS JACKSON and Sir ALAN WILSON—to the Advisory Council on Scientific Policy for the period ending July 31, 1964. Sir Willis, at present director of research and education, Associated Electrical Industries (Manchester), Limited, will become Professor of Electrical Engineering at the Imperial College of Science and Technology, South Kensington, on Sunday.

During a tour of his constituency last week, Mr. J. P. W. MALLALIEU, MP for Huddersfield East, went to the coal face at Shuttle Eye Colliery, Grange Moor, near Wakefield (Yorks), and talked to the miners there. He was accompanied by Mr. C. V. Peake, general manager of the No. 6 (North Barnsley) Area, North-Eastern Divisional Coal Board, Mr. R. Holdsworth, secretary, and Mr. C. Barnett, president of the Grange Moor branch of the National Union of Mineworkers.

Where the Cranes Fly

ALTHOUGH Thomas Smith & Sons (Rodley), Limited, crane and excavator manufacturers, of Leeds, has machines which can be adapted for almost any purpose in industry, it is the smoothness with which they can be operated which catches the eye in the firm's colour film, "Smith's Make News," intended for distribution in this country and oversea, and shown to the Press on Thursday of last week.

Diesel-driven, 10-ton monsters, carrying huge loads, are manœuvred with the apparent ease of a small car and much of the speed at which modern buildings rise, and old ones are demolished, is due to the increasing use of the company's products.

With over 140 years' experience and knowledge behind it, the firm now produces machines which are widely used in building, quarrying, and open-cast mining as well as at docks and for dredging. One of the chief aims of the film is to help exports. "We want to sell Britain abroad," said Mr. Norman Smith, assistant managing director, and great-grandson of the founder of the firm.

Institute of Quarrying Visits GEC Works

ON Thursday of last week 40 members of the London & Home Counties branch of the Institute of Quarrying visited the Fraser & Chalmers engineering works of the General Electric Company, Limited, at Erith (Kent). Included in the party were Mr. B. H. Marriage, president of the Institute of Quarrying, and Sir Gilbert Davis, chairman of the London and Home Counties branch.

Members were shown screens, feeders, crushers, and winders in course of manufacture, and three special demonstrations were given. The first involved a test run on two new machines, a reversible impactor for crushing rock, and a Sherwen horizontal resonant mechanical vibrating screen.

EXECUTIVES of the two biggest craft unions in the shipbuilding industry, the Boilermakers' Society and the Shipwrights' Association, agreed at a meeting at Newcastle-upon-Tyne last week, to recommend their members to vote for amalgamation of the two unions. A joint statement said that the amalgamation would provide that if members of either section were not available in the shipyards because of shortage of labour, interchangeability between the sections would apply.

Industrial Accidents

INCREASE CAUSES MINISTER CONCERN

MEASURE of the concern which is felt by the Minister of Labour, Mr. John Hare, at the increasing number and severity of industrial accidents was his breaking with precedent on Monday and attending the Press conference at which the Chief Inspector of Factories introduced his annual report. Mr. Hare was present in order to voice his concern and to describe the measures he is taking to deal with the rise in accident incidence.

Nearly 700 deaths and nearly 200,000 injured constituted a major disaster, said Mr. Hare, though the figures made less of an impact than a sudden disaster because they were spread over a large number of firms and went on regularly over the year. Apart from suffering, accidents on this scale represented a wholly indefensible waste and industry could not afford such losses.

He proposed to write to the employers' associations in sectors of industry where safety is a serious problem, the engineering industry being one in particular. He is to attend the conference of employers and workers in the shipbuilding and repairing industry in Newcastle-upon-Tyne on October 16, and after that will discuss with the British Employers' Confederation and the TUC, whether such joint conferences could do good in other industries.

Employers' Responsibility

"New safety regulations which I have just made for both these industries come into force next March. Before then, in consultation with leaders of both sides, I shall consider how we can get across to both management and workers the need for new and more vigorous efforts to cut the accident rate," Mr. Hare said.

He made it quite plain that he felt that the responsibility for improvement rested with the employers themselves—the problem was to get them, together with the unions, and the individual workers, to take these things more seriously. However, the Ministry intended to use all its powers of persuasion to make each industry put its own house in order.

He joined with the Chief Inspector of Factories (Mr. T. W. McCullough) in concern at the serious increase in accidents to young workers—an increase of 15 per cent. last year over 1959. That more young people entered industry that year might be an explanation, but it provided no excuse as they had known for years that larger numbers would be leaving school and starting work in the 1960s. When young people went into factories it was for their employers to see that they were properly introduced to their work, well trained, and properly supervised. Close supervision and a little extra care and imagination in the first weeks and months would make a big difference, he believed.

Mr. McCullough, in his report, states that on any analysis 190,000 accidents—675 of them fatal, compared with 598 in 1959—represents a heavy toll of human and economic losses. In factories, the rate of increase in fatal accidents was much less than for accidents generally. Last year the increase in reported accidents continued, at an accelerated rate, the movement begun in 1959, which reversed the downward trend recorded since 1948. Accidents in factories numbered 161,524, an increase of 13,020, and were the highest since 1955. Those on building operations and works of engineering construction rose by 1,420 to 19,705, the highest number ever reported in one year on this type of work.

Fatal accidents followed a different trend. In factories there has been an almost continuous decrease since the war, and the 1960 total of 354 deaths was only four more than the record low figure in 1959. The number of persons or firms prosecuted for offences concerning the fencing and construction of machinery which resulted in death or injuries rose from 300 in 1959 to 445 in 1960, and the amount of fines imposed from £6,158 to £14,716.

Last year 2,247 cases against 982 different defendants —an increase of one third over 1959—were dealt with by the courts on prosecutions instituted by the factory inspectorate. The gross amount of fines, £38,650, was two and a half times more than in 1959.

Also published on Monday was the Chief Inspector's annual report on industrial health. It refers to the constant watchfulness exercized by inspectors against health risks which might arise from the growing use of newer metals in industry and cites the increasing use of copper-based beryllium alloys. The liability of harm from the use of many industrial solvents if precautions are neglected is emphasized and the general principles of protection against such harmful effects are described. Advising that medical supervision should be arranged for all workers exposed, or liable to be exposed, to the toxic effects of solvents, the Chief Inspector says: "Solvents are necessary for many industrial purposes and their use is likely to become more widespread. Employers and workers alike should therefore understand something of their effects and the precautions which should be taken."

SCOW to Build Reservoir for Margam Works

TO augment the industrial water supply to its Margam (Glam) steelworks, Steel Company of Wales, Limited, has bought 370 acres of nearby farmland as a site for a new reservoir with an initial capacity of 400,000,000 gallons.

A statement by SCOW said that over the years the surface of the land had gradually sunk due to mining subsidence, and the company was taking advantage of these circumstances to construct the reservoir. By increasing the depth, the capacity might later be increased to 600,000,000 gallons.

Model of Radio Telescope for Science Museum

COMMENTING that long-range rockets, artificial satellites, lunar probes, and men in orbit had become almost commonplace in a matter of 15 years, Mr. A. J. Peech said in London on Tuesday that when historians looked back on the Space Age, there was no doubt they would be impressed with the almost incredibly rapid scientific development.

MR. A. J. PEECH

Mr. Peech, who is deputy chairman and general managing director of the United Steel Companies, Limited, was speaking on the occasion of the presentation by him of a model of the Jodrell Bank radio telescope to Dr. H. H. Follett, director of the Science Museum. The telescope was built by the United Steel Structural Company, Limited, a member of the United Steel group.

Such Space Age developments were enormously expensive, Mr. Peech said, and Britain had been unable to contemplate the necessary expenditure, but it had to its credit a remarkable achievement—the Jodrell Bank radio telescope—which had tended to produce international scientific co-operation. By its use it had earned world-wide prestige for this country.

Its construction was an exceptional structural engineering project and the United Steel Companies were proud to have been associated with it.

Ironfounding and the Clean Air Problem

ONE of the worst problems in industrial air pollution is presented by the ironfounding industry, according to Mr. A. Archer, Chief Public Health Inspector, of Halesowen, Birmingham. There were 1,490 ironfoundries in Britain, he said, in a paper read at the annual conference of the Association of Public Health Inspectors at Bournemouth, on Thursday of last week.

It had been estimated that the cupolas emitted 25 lb. of dust per ton of metal melted and last year nearly 4,000,000 tons of iron castings were produced. Mr. Archer called for a systematic survey of all industrial premises to discover what are the problems and the type of plant needed to deal with them, and recommended the setting up of working parties to give guidance to industry and local authorities.

HENRY SYKES, LIMITED, London, has appointed Scottish Land Development Corporation, Limited, as agents for its pumps and other equipment in Scotland and the four Northern counties. There will be three main service centres at Glasgow, Fife, and Newcastle, and Mr. A. K. G. Gilbertson, who is located at the Fife depot, is responsible for overall operations.

Midlands Industry Reviewed

REVIEWING the industrial situation in the Midlands, Major C. R. Dibben, chairman of the Midland Regional Board for Industry, said on Tuesday that some Midlands industries, notably steel production, vehicle manufacture, and the more expensive consumer goods sectors were becoming less buoyant, and the immediate outlook for the motor industry in particular was not encouraging.

Major Dibben, who is chairman of the British Bolt, Nut, Screw, and Rivet Federation, and associated federations, chairman of Glow-Worm Boilers, Limited, and a number of other companies, added that, on the other hand, Midlands industrial activity generally remained at a high level and capital goods, machine tools, electrical industries, and building and civil engineering were all busy. Some steel producers had experienced a marked slackening in demand and a number of foundries and forges were working below capacity. The railway carriage industry was still facing an inadequate and uneven flow of orders.

It was too early, he thought, to gauge the effects of the Chancellor's measures, but he thought they would encourage reviews of stock levels and expansion plans. Trends during the next two months needed watching very closely because they would set the pattern, one way or the other, for the first half of 1962.

More Unemployment but Over 328,000 Vacancies Unfilled

THERE were 317,094 persons unemployed in Great Britain on September 11, 1961, 1.4 per cent. of the total labour force, the same proportion as in August this year and in September, 1960. Excluding school-leavers, the number wholly unemployed rose by 11,264 to 276,185, the normal seasonal increase being about 13,000.

The number of registered unemployed in Northern Ireland on September 11 was 35,652, 7.4 per cent., which was 511 less than on August 14. During the four-week period ending September 6, 182,673 vacancies were filled, but the number of vacancies remaining unfilled at that date was 328,125. This was 31,394 fewer than in August.

Tees-side's "Fantastic" Expansion

EXAMPLE of "fantastic" industrial expansion now taking place on Tees-side was how Sir Mark Hodgson, chairman of the Northern Regional Board for Industry, described the £2,000,000 oil storage and distribution centre of Shell-Mex & B.P., Limited, at Teesport. The board visited the installation on Monday.

Sir Mark said that the Teesport development was largely keyed to the oil demands of the iron, steel, and chemical industries and within two years of the opening of the original installation, costing over £1,000,000, the company had had to embark on extensions costing a further £840,000. "No other regional board in the country can claim greater co-operation between industrial management and the workers," said the chairman.

Obituary

DR. T. P. COLCLOUGH

Technical Adviser to the Steel Industry

ANOTHER loss to the iron and steel industry has to be recorded with the death last Friday of Dr. Tom Peach Colclough, technical adviser to the British Iron and Steel Federation and one of the industry's leading personalities. He was 76. His advice on planning and development in the steel industry, was held in high esteem not only in this country but abroad, and his knowledge and personal influence from 1945 when he joined the federation as technical adviser, enabled him to play a key part in the post-war development programmes of British steel. Oversea, he had been technical adviser for projects in India, Germany, Austria, Turkey, China, and New Zealand.

Educated at Manchester and Sheffield universities, Dr. Colclough entered the industry in 1916, first with the Brown-Firth laboratories in Sheffield under Dr. Hatfield and in 1920 when he was appointed chief chemist at the Park Gate Iron & Steel Company, Limited. He later became chief metallurgist, open-hearth manager, and technical officer.

DR. T. P. COLCLOUGH

In 1929 he was appointed technical director of H. A. Brassert & Company, Limited, consulting and constructing iron and steelworks engineers, of London, E.C.4, and in this capacity was closely connected with the planning and development of Corby, Ebbw Vale, and other steelworks. It was his study of continuous strip mills in the US that played a prominent part in the setting up of such a mill in South Wales by Sir William Firth.

Widely Travelled

From 1942 to 1945 he acted as technical adviser to the Iron and Steel Control of the Ministry of Supply and after the war, in addition to his work in this country, he found time to travel widely—as technical adviser to the Control Commission in Germany, as a member of the Coates Mission to the Indian Government, as technical adviser to ISCON, the British consortium responsible for the Durgapur Steelworks, as a member of the Royal Commission on the steel industry of Southern Rhodesia, and as leader of the federation missions to the USSR in 1956, Poland in 1957, and Yugoslavia in 1960.

Dr. Colclough never underestimated the value of research and used his wide influence wherever possible in this field, especially in the work of the British Iron and Steel Research Association of which he was appointed a council member in 1950.

For his work during the war he was made CBE in 1947. He held the highest award of the Iron and Steel Institute—the Bessemer Gold Medal—and in May was appointed an honorary vice-president of the institute. He was awarded the D.Sc. by Manchester University and the M.Met. by Sheffield in 1937 and the D.Met. by Sheffield in 1959.

DR. C. C. GARRARD

FORMER director of the General Electric Company, Limited, Dr. Charles Cornfield Garrard died on Thursday of last week at the age of 84. Educated at the Central Foundation School, London, and Finsbury Technical College, he won a scholarship to Göttingen University, Germany, where he gained his Ph.D. In 1908 he became manager of the switch and controller works of the GEC at Witton, Birmingham, and 20 years later was put in charge also of the transformer works. In 1942 he was appointed joint general manager of the Witton group of engineering works and the following year was elected a director. He was resident director and consultant from 1947 until he retired in 1953.

He was a member of the Institution of Electrical Engineers, an associate member of the American Institution of Electrical Engineers, and a Fellow of the Royal Economic Society.

MR. C. M. VIGNOLES

WHILE on holiday in Italy, the death took place on Saturday of Mr. Charles Malcolm Vignoles, chairman of Evershed & Vignoles, Limited, electrical instrument manufacturers, of London, W.4, and former managing director of Shell-Mex & B.P., Limited. He was 60. He joined the Shell group in 1924 and during the war he was closely connected with the organization of the nation's wartime supplies of oil.

At the time of the Suez crisis in 1956 he was chairman of the Oil Industry Emergency Committee which assisted the Ministry of Power. After his retirement from Shell-Mex & B.P. in June, he became chairman of Evershed & Vignoles of which his father, Lt.-Col. W. A. Vignoles, was a former managing director. He was a member of the council of the Institute of Directors and of the council of the Royal Society of Arts.

The death has occurred at his Sutton Coldfield home of Mr. ARNOLD JOSEPH GOOCH, a director of Parson, Limited, iron and steel merchants, of Birm-

ingham, a subsidiary of Guest, Keen & Nettlefolds, Limited. He was 54 and had been with the firm for 40 years. Well known in Midland iron and steel circles, Mr. Gooch was a committee member of the Institute of Sheet Metal Engineering.

While on a business trip to Scandinavia the death took place suddenly on September 10 of Mr. J. FRANK BEGLEY, sales director of the Plibrico Company, Limited, refractory engineers, of London, N.W.9.

The death has occurred at the age of 63 of Mr. SAMUEL BELLIS, who had been sales manager, central marketing, of British Insulated Callender's Cables, Limited, since 1957. For five years until he moved to London in 1950, Mr. Bellis was manager of the Leeds branch of the company.

The death has taken place of Mr. JOHN LESLIE TROMANS, until recently senior foreman in the electrical engineer's department of Newton, Chambers & Company, Limited, Thorncliffe, near Sheffield. He was 62. He joined the company as an apprentice in 1915 and was first promoted to foreman in 1937.

The death occurred recently of Mr. THOMAS SMITH, who founded the precision engineering company of Smith, Fullerton, Limited, Glasgow, in 1933. He was well known for his work on diesel engines governors, and injection equipment. After an illness in 1957 he went into partial retirement, but continued as chairman of the company.

The death has occurred suddenly at Bude (Cornwall) of Mr. JAMES M. IRELAND, secretary of the Parsons & Marine Engineering Turbine & Research Development Association (Pametrada). He was 54. Mr. Ireland, who entered marine engineering after the last war, was formerly secretary of Richardsons, Westgarth & Company, Limited.

The death has occurred at the age of 56 of Mr. ARTHUR J. LLOYD, a director of Vitreflex, Limited, manufacturers of metal coating, of Llanelly (Carm). He was also a director and secretary of the Gorse Galvanizing Company, Limited, St. David's Tinplate Company, Limited, and a former director of the Bynea Steel Works, Limited, near Swansea.

Well-known figure in the Cornish tin-mining industry, Mr. JAMES HERBERT BENNETTS has died at the age of 79. General manager of the Geevor Tin Mines, Limited, from 1944, he later became a director, keeping his seat on the board when he retired as general manager in July last year. Mr. Bennetts graduated at the Camborne School of Mines, of which he later became a governor. He held mining appointments in South Africa, and in South Wales, managing Polhigey Mine, Carnellis, in 1927 and later Wheal Reeth, Germoe, and for a short time, Cligga, Perranporth. Mr. Bennetts was a former president of the Cornish Institute of Engineers and a member of the Institute of Mining and Metallurgy.

Ministry's Help in Training Engineering Apprentices

DESIGNED by the Ministry of Labour to help small engineering firms which do not have the facilities to give apprentices an all-round training, the first full-time 12-month intensive training course has just ended at the Long Eaton (Nottingham) Government Training Centre. Certificates were presented to the trainees on Thursday of last week by Air-Commodore Cooper (Nottingham), chairman of the Local Joint Apprenticeship Committee for the Engineering Industry. A new course began on Monday and the class is full. Some firms have reserved places for the 1963 course.

Fall in European Demand for Coal Expected

COMMERCIAL demand for coal in Europe during the coming three months will be about 2 per cent. less than the demand during the corresponding period of 1960, according to the forecast of the Coal Committee of the Economic Commission for Europe which met in Geneva last week. Consumers are expected to draw on their stocks to a greater extent than during the fourth quarter of 1960, however, so that the fall in coal consumption will be considerably less than that in demand and should be about 1 per cent. Thermal power stations are the only expanding sector.

As a result of closures of uneconomic capacity the slackening in demand during the fourth quarter of 1961 is not expected to lead to deterioration of the overall market situation. In the UK, it was reported, coal production is below demand and pithead stocks are expected to fall considerably during the fourth quarter of 1961.

The committee, composed of Government representatives of 19 countries, also examined import and export production is below demand and pithead stocks are as well as likely imports from the United States during the next quarter.

NCB and Magazine Link in Publicity Drive

NEW venture for Reader's Digest is linked with the progressive campaign being waged by the National Coal Board. A booklet on solid fuel issued as a supplement to the October issue of Reader's Digest is the first time that this magazine has published an inset sponsored by an advertiser.

At a luncheon in London on Monday to mark the launching of the booklet, Lord Robens, chairman of the National Coal Board, said there had been a rapid rise in standards of comfort in British homes over the last 10 years, but in our climate the basis of all comfort was proper heating. We lagged behind in modern standards of heating—only about 5 per cent. of British houses were centrally heated, compared with 80 per cent. in the US.

A recent survey had shown clearly that the majority of householders *thought* that solid fuel provided the most satisfactory heating at the lowest cost. The NCB was determined to prove that this was true by making the facts known to every householder.

Reader's Digest has a circulation of over 1,000,000 and a further 1,000,000 copies are being printed and circulated through the board's regional sales offices, coal merchants, distributors, and heating engineers.

Gold Medal for Centramatic "35" Boiler

BRITISH full automatic domestic oil-fired boiler—the Redfyre Centramatic "35"—has won a gold medal at the California State Fair. The boiler, which is made by Newton, Chambers & Company, Limited, Thorncliffe, near Sheffield, was one of 13 exhibits which won Design Centre awards from the British Council of Industrial Design in May.

The UK exhibit as a whole, including other Design Centre award-winning products, gained first place in the International Exhibits section of the Fair.

DUST EXTRACTION

from the Fume of Electric Arc Furnaces

In this paper, translated from Stahl und Eisen, 81 (1961) 1, January 5, pp. 41-46, the author, Wolf Muhlrad, describes the nature of the exhaust gas and dust in electric arc furnaces and the various types of equipment for collecting and cleaning the exhaust gas. The author deals particularly with bag filter methods and also gives comparative costs of various methods.

THE evolution of fume in electric arc furnaces and its removal[1, 2] gives rise to two different problems—leading off the exhaust gases, in order to ensure that the air in the steel melting shop remains clean; and treating the fumes before releasing them into the atmosphere, to reduce or prevent pollution of the environment.

Approximately 7,300 to 11,000 Nm^3 of exhaust gases per ton of steel have to be collected. This includes a considerable volume of infiltrated air. These figures apply if extraction hoods or cowls are used over the furnace. If, however, the exhaust gases issue from a pipe, directly from the roof, then the exhaust gas volume is only 2,500 to 5,000 Nm^3 per ton of steel.

The gases formed in the arc furnace consist of:—Nitrogen from the unavoidable air infiltration; carbon monoxide or carbon dioxide from combustion of the carbon which is contained in the bath, or is used as a reducing agent, or results from the progressive burn-off of the electrodes.

To these substances are to be added metal vapours and traces of sulphur compounds. The electric arc creates such high temperatures that volatilization of the metals is inevitable. These vapours oxidize rapidly if they come into contact with oxygen either in the furnace atmosphere, or after leaving the furnace. The volume of volatilized metal depends largely on the vapour pressure; it is so much the greater, the more rapidly the evolved gases are carried off. H. Kosmider, H. Neuhaus, and H. Kratzenstein[3] have plotted vapour pressure curves for pure iron and pure manganese. They report that the fume of electric furnaces varies in chemical composition according to the nature of the burden, and changes in composition in the course of the melt. The dust output is generally between 2.5 and 8 kg./ton steel. The data in regard to the extent of the dust concentration in exhaust gas fluctuate considerably, in each case depending on how much infiltrated air is contained in the fume. Dust concentrations of 4.5 to 8.5 g/Nm^3 have been instanced, but these must be maximum concentrations during peak productions or mean dust contents in theoretical gas volumes (without infiltrated air).

The chemical composition of this dust is very different in the successive stages of the melting process and is dependent on the furnace burden. Table 1 gives a comparison of dust analyses covering the whole course of two separate melts.

TABLE 1.—*Chemical Composition of the Dust.*

	After K. Guthmann.[1]	After W. B. Wallis.[4]
	per cent.	per cent.
Fe_2O_3	19	37.2
Cr_2O_3	1	0.13
NiO	0	0.02
MnO_2	4	4.2
SiO_2	14	2.98
Al_2O_3	2	0.41
CaO	22	5.17
MgO	38	2.45
Burning losses	0	3.6
PbO	0	3.92
CuO	0	0.4
ZnO	0	35.5
SO_3	0	1.54
Alkalies (Na_2O-K_2O)	—	1.6

It should be noted that in the case of the American data, we are dealing with dust derived from a large furnace with charges of 105 tons, which are worked without oxygen lance and in which structural steels are made.

Table 2 gives two examples showing the mean grain size distribution in this dust.

TABLE 2.—*Mean Percentage Grain Size Distribution in the Dust.*

	After K. Guthmann.[1]		According to Swiss data.
	1.	2.	
Particles below 5 microns	67.9	71.9	72.5
Particles from 5 to 10 microns	6.8	8.3	11.5
Particles from 10 to 20 microns	9.8	6.0	3.0
Particles from 20 to 44 microns	9.0	7.5	7.0
Particles above 44 microns	6.5	6.3	6.0

The above-mentioned physical and chemical properties are applicable for dust from electric furnaces which are worked without oxygen. If the refining is performed with an oxygen lance the very high bath temperatures of 1,800 to 1,900 deg. C. favour the volatilization of metals, which immediately oxidize, and thus take up a considerable volume of oxygen. This dust contains essentially iron oxides. The latter impart a pronounced dark brown colour to the exhaust gases which is due on the one hand to the very great fineness of the dust particles, and on the other hand to the very high dust concentration, which is $10 g/Nm^3$ and over.

The iron oxide formed during the refining process has an average particle size of 0.01 to 0.10 micron. About 85 per cent. of the dust particles are below 4 microns. Thus, on account of the very great fineness of the dust and its high concentration, the cleaning of exhaust gases presents a very difficult problem which is made even more troublesome by the high temperature of the gas.

Three Possible Solutions

The fume produced in the furnace sets up a pressure therein so that it tends to escape through all available openings (charging door, slag notch, and electrode holders). The back pressure inside is the greater the more gas is formed—particularly in the case of an oxygen lance—and the smaller the cross-sections of the exhaust gas duct. These exhaust gases must be carried off from the buildings, on account of the annoyance and impaired visibility they cause[3]. There are three possible solutions, as follow:—

(1) *Suction Without Dust Extraction.*—If the exhaust gases are not cleaned before they are released into the atmosphere—if, for instance, the steelworks are located in a region where no annoyance would be occasioned—it is generally considered sufficient to allow the gases to rise upwards in the buildings where they escape through suitable openings provided for this purpose[5].

In some cases, attempts have been made to provide suction hoods at a sufficient distance above the furnaces to ensure that the travelling cranes are not impeded and to fit ventilating fans in these hoods in order to increase the ventilation. In most cases, this solution has caused more harm than good. Even with the smallest cross-current of air, a considerable volume of the gas is deflected from the hood and then disperses in the shop. It must be admitted, however, that these suction hoods are frequently very badly constructed and do not cover a sufficiently large area in order to catch all the hot fume rising from the furnace and carry it off. Such a hood is shown diagrammatically in Fig. 1. The conventional representation of the gas flow shows vortices which form along the wall of a badly constructed hood.

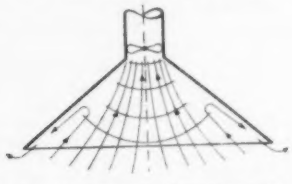

FIG. 1.—GAS FUME EXTRACTOR HOOD.

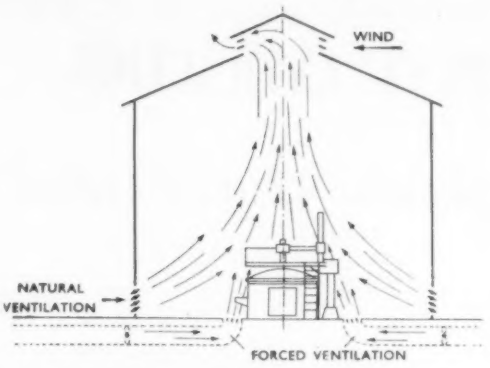

FIG. 2.—VENTILATION OF THE ELECTRIC FURNACE SHOP.

Extracting the exhaust gases through roof openings can only be a practical solution if the following requirements are fulfilled. The building must be so built that rising of the hot gases is favoured and their discharge through the smoke stacks is facilitated. The air intakes in the shop must be near floor level, the hot waste gases must be conducted towards the middle of the roof, so that no escape through the side walls is possible (Fig. 2).

For instance, a part of the troublesome exhaust gases produced in aluminium electrolysis tanks is carried off in this way: this method is preferred to using a suction hood over the tanks. However, this solution has certain disadvantages. The shops are very cold in the winter. This can be remedied by supplying fresh air through underfloor ducts close to the furnace (*cf.* Fig. 2). Furthermore, the coarse dust in the exhaust gases is deposited in the shops as dirt which is undesirable for the foundry personnel and for the state of the working equipment. In addition, the crane drivers are working in foul air so that the drivers' cabs must be made airtight and air conditioned.

Suction Hoods.—In small furnaces, with a charge of less than 20 tons, *i.e.*, with a container diameter under 4 metres, the fume is very often trapped by means of suction hoods which are fixed on the removable furnace roof.[6,7] A pipe for the fume leads to the fan and to the dust-extraction plant. In very small furnaces, these hoods are in one piece and cover the whole furnace. In larger furnaces, several subsidiary hoods are often arranged at the principal fume-producing points:—The door, the slag notch and the electrodes. These hoods are connected to a common pipeline (Figs. 3*a* to 3*c*).

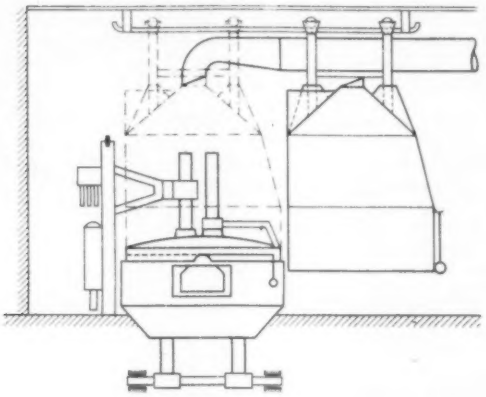

FIG. 3*a*.—EXHAUST GAS HOOD OVER AN ARC FURNACE IN THE SLEWED POSITION BEFORE TAPPING (ACCORDING TO H. MÜLLER).

By this arrangement, pollution of the atmosphere in the shops is prevented. From the hygienic aspect, as well as that of external appearance, this represents a substantial advance on the first-named solution. Nevertheless, it also has disadvantages. Certain parts of the hood are subjected to high temperatures and simultaneously, also, to corrosion, so that frequent maintenance is necessary. Furthermore, the hoods impede the supervision and inspection of the furnaces, so that this solution is frequently opposed by the furnace personnel. In addition, the fume carried off by the hoods is frequently greatly diluted with leakage air and thus for cleaning larger cleaning equipment is necessary, with correspondingly higher plant and operating costs.

For all these reasons, the present tendency in the USA is to restrict these hoods to small furnaces.

(3) *Smoke Ducts in the Roof.*—For electric arc furnaces, the solution now increasingly favoured is to extract the fume directly from the furnace through an opening in the roof. The furnace is under a slight pressure of 0.5 to 2 mm. water, which is controlled by a suction fan or an air valve in the circuit. The opening or exhaust gas pipe in the roof should be as large as possible so that as little fume as possible escapes at the electrodes or through the doors. Figs. 4 and 5 show a 125-ton furnace with a container diameter of 6.7 m.; its gas pipe in the arch has a diameter of 880 mm. and can be connected in two ways to a gas discharge pipe.

In Fig. 4, the fume port in the roof consists of a pipe which is brick lined inside and the end of which lies opposite the suction pipe. The latter is fixed and is water-cooled.

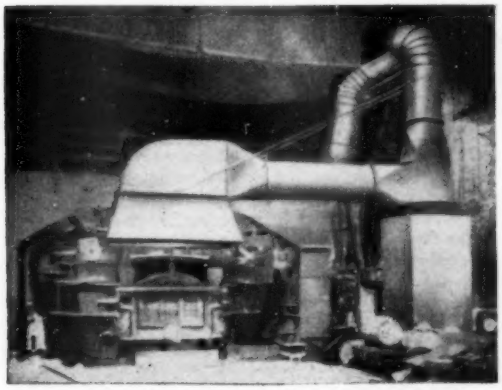

FIG. 3*b*.—SLEWING SUCTION HOOD, DESIGNED BY THE VISCO ENGINEERING COMPANY, LIMITED, OVER A 30-TON ARC FURNACE.

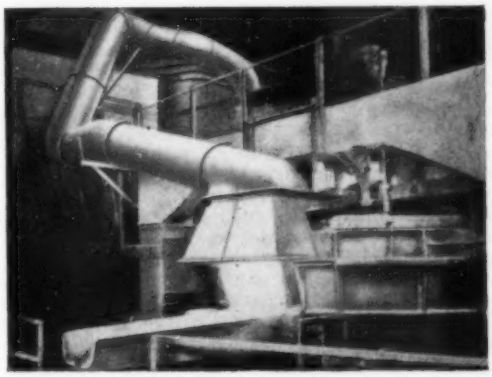

FIG. 3*c*.—SLEWING SUCTION HOOD, DESIGNED BY THE VISCO ENGINEERING COMPANY, LIMITED, OVER TAPPING LAUNDER OF AN ARC FURNACE.

Fig. 5 shows a swivelling suction pipe which is set directly over the arch outlet. It is water cooled only over part of its length.

Direct extraction from the furnace has the advantage that the volume of gas extracted is small, because only a small volume of air can infiltrate. Due to this, however, the temperature of the extracted gas fume is higher, but the dust-extraction plant can be correspondingly smaller. This solution has, moreover, the further advantage that control and maintenance of the furnace are not impeded.

Cooling the Exhaust Gas

The fume extracted from the furnace during refining with oxygen boost has a temperature of 1,600 to 1,800 deg. C. and contains a relatively large quantity of carbon monoxide, the combustion of which, due to air infiltration, causes the temperature to rise still further. The exhaust gas must

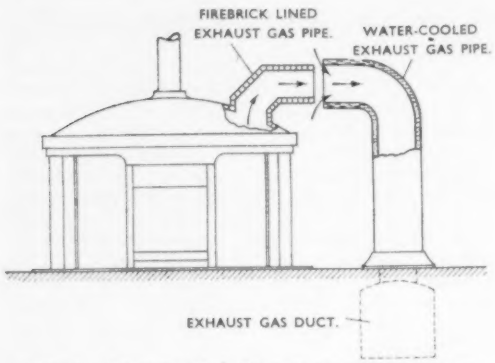

FIG. 4.—EXHAUST GAS OUTLET WITH REFRACTORY LINING.

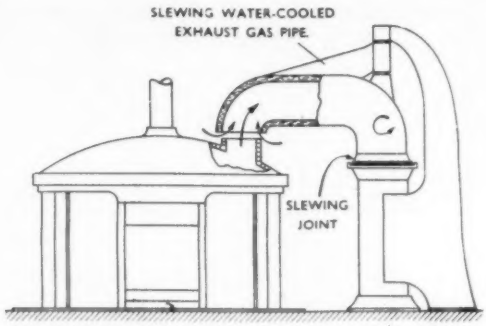

FIG. 5.—SLEWING WATER-COOLED EXHAUST GAS PIPE.

therefore be cooled before passing through the dust-extracting plant.

In most cases, either of two methods can be used, singly or in combination:—

(1) Total cooling of the exhaust gas by means of infiltrated air down to a temperature which is acceptable in the interests of the preservation of the pipes and the dust-extraction plant used with fixed or swinging suction hoods over the furnace. With this method of cooling, large volumes of exhaust gas are produced and the dust-extraction plant requires to be correspondingly large.

(2) Partial cooling with air infiltration to a temperature of 600 to 800 deg. C., with subsequent further cooling by water spraying and evaporation. In this case, the water available is utilized under optimum conditions since 1 kg. water can absorb 600 to 630 kcal., compared with the 50 to 60 kcal. which can be absorbed by heating 1 kg. of water when cooling the gases in a scrubber. Thus, in most cases, it is possible to reduce the water consumption in the ratio 1:10. Evaporation of 38 to 40 g. water is generally sufficient to cool 1 kg. gas through 100 deg. C.

(3) Total cooling of the exhaust gas by water spraying and evaporation. Using this method, fume can be treated which, after combustion of the carbon monoxide, is collected at a temperature of 1,000 to 1,200 deg. C. This form of cooling, the aim of which is to produce a very considerable rise in the dew point, is particularly to be recommended if wet cleaning of the exhaust gas is intended.

A further cooling method consists of installing heat exchangers or even waste-heat boilers. But this method is not generally economical in the case of arc furnaces since the fume is produced intermittently and always only for short intervals.

Dust Extraction from Fume

In the simplest and cheapest arrangement, the extraction of the dust from the fume is performed in cyclone separators with an extraction of only 30 to 50 per cent. The exhaust gas passing out into the atmosphere then contains only particles of less than 10 microns, the rate of settling of which is low (below 6 mm./sec.), so that they disperse in the air, if the stack is high enough, to discharge the evacuated gases out of reach of the eddies which form around buildings in windy weather.

A 70 to 80 per cent. particle extraction is attained by the familiar scrubber technique which is relatively cheap in capital and running costs, but still considerably dearer than cyclone separators.

Both methods are to be considered for small and medium-sized arc furnaces if refining is not conducted with an oxygen lance. As soon as oxygen is added, the dust becomes far too fine and too concentrated and picks up very little moisture as it is not easily wetted, so that no adequate degree of dust extraction can be attained.

If a higher extraction performance (above 90 per cent.) is required, then devices are necessary which are substantially dearer in capital and running costs. The exhaust gas volume must therefore be kept as small as possible in order to keep the cost of the dust extraction plant low.

Fine cleaning methods which are characterized by a high extraction rate below 1 and 2 microns are:—

Wetwashers or scrubbers such as disintegrators or Pease-Anthony;
Venturi scrubbers;
Dry and wet electrostatic precipitators;
Bag filters.

Theisen—or "Buffalo"—disintegrators are known from the cleaning of blast-furnace gases. Results in regard to the use of disintegrators for cleaning gas fumes from arc furnaces have not as yet been published. Operating costs are very high on account of the high power and water consumption.

Pease-Anthony Venturi scrubbers are successfully used in numerous steelworks in the USA. Their extraction efficiency, in the case of fume from arc furnaces is between 90 and 99 per cent., depending on the flow velocity of the gases and the amount of the pressure drop in the scrubber, which is between 500 and 1,250 mm. water, with high power consumption. This can be reduced, if the Venturi scrubber is only operated at times during which the dust development is heavy, *i.e.*, during the

short period of refining with oxygen (about 7 to 9 per cent. of the total duration of the melt). In the wet process, it must be borne in mind that the traces of acid in the fume leads to corrosion problems.

Electrostatic precipitators are extensively used in the iron and steel industry, and are used in some cases for cleaning fume from arc furnaces. They are only reliable in operation if the dust has a specific resistance of less than 10^{10} ohm/cm.^{3}. If this standard resistance is exceeded, then contamination of the precipitation plates and electrodes is unavoidable, for which reason the extraction efficiency of the equipment decreases. The exhaust gas from arc furnaces frequently contains large volumes of zinc oxide, silicon oxide, and lime, which impart to the dust deposited on the precepitation plates a higher specific resistance than the value mentioned above. Furthermore, it must be borne in mind that the specific resistance of the dust deposits depends not only on their chemical composition, but also on the constitution of the gases in the electrical field, the presence of water vapour being always favourable. It is also dependent on the temperature, in the form of a bell-shaped curve with a peak between 220 and 280 deg. C. so that the gases must be cooled by water spraying in order to keep the temperature of the electostatic precipitator below 150 deg. C.

For cleaning blast-furnace gases, however, the wet electrostatic precipitator is now used exclusively with a reliable extraction efficiency of 99 per cent. and over. It requires the provision of sludge processing equipment, and the total cost is, therefore, increased.

Cloth or bag filters usually also have an extraction rate over 99 per cent. Before entry into the filtering equipment, however, the exhaust gas must be pretreated by a cooling and temperature regulating equipment which must work rapidly and reliably in order that the permissible filtering temperatures are not exceeded.

The upper limit which depends on the nature of the fabric is from 250 to 280 deg. C. in the case of silicone-treated glass fibre fabrics; 140 to 150 deg. C. for Tergal; 130 deg. C. for Orlon and Krylor; 105 deg. C. for wool, and 90 deg. C. for cotton. If these temperatures are exceeded, the danger arises that the filter bags will be destroyed by burning. Cotton bags, in particular, are very sensitive to a high temperature due to the danger of charring.

The lower temperature is determined by the dew point of the gas. In every case where this limit is exceeded, there is a danger that the filter bags will become obstructed due to condensed steam. In the past, the filter bags had a life of only 3,000 to 4,000 working hours which was a heavy burden on working costs. Through improvements in the quality of the fabric and in the cleansing devices for the filter bags, it has been possible to increase their life to the range 14,000 to 18,000 working hours. Numerous cloth filter installations are used today by industry in France for cleaning exhaust gas from ferro-alloy furnaces (ferro-silicon, ferro - tungsten, ferro - manganese, and ferro - chromium).

All the installations—some with several years' service—have filter bags made of Tergal. The working temperatures are kept between 100 to 110 deg. C. The dew point of the gas is about 40 deg. C., the upper temperature limit of the filter bag 150 deg. C., the safety margin between the two limiting values being such that installations operating in the open air do not require to be provided with heat insulation.

Thus bag filters for exhaust-gas dust extraction in two ferro-silicon furnaces with a power output of 10,000 kVA have worked for over 11,000 hr.; during this period, the overall state of the filter bags was found to be very satisfactory, and only about 7 per cent. of them required to be renewed; the remainder were in perfect condition and ready for a new run of approximately eight months.

Filter bags of glass fibre fabrics which are insensitive to temperature to a certain degree, have made rapid strides in the USA. This fabric has been substantially improved in recent years by new spinning processes and, above all, by treatment with silicones which gives it a longer life. Furthermore, the surface of this fabric is very smooth which considerably facilitates cleaning. Nevertheless, the glass fibre fabrics cannot withstand any kind of mechanical cleaning, for instance, by shakers, since the glass is too brittle. They can only be cleansed by blowing through in counterflow.

The oldest filters made of this fabric are to be found in plants where soot forms. The life of the filter bags is in this case from 18 to 24 months, in continuous operation. These filters are also used in other branches of industry, among others, for arc furnaces. One of these installations has been in service since 1958; it works behind a spray cooler, which keeps the temperature at the filter inlet at from 220 to 250 deg. C.

The dust extraction equipment must be selected having regard to the location of the works, the desired efficiency, the space available, and the recovery and value of the dust. Electrostatic precipitators and bag filters require considerably more space than the wet process. In the case of the latter, however, filter beds and sludge processing equipment are necessary. If such installations are already available in a works for other purposes,

TABLE 3.—*Cleaning Costs for Exhaust Gases in Steelworks.*

	Multiklon.	Dry electrostatic precipitator.	Wet electrostatic precipitator.	Bag filter.	Disintegrator.	Venturi scrubber.
Cost of an installation (in thousands of new francs)	150	800	1,300	700	600	400
Maintenance costs per 1,000 Nm³ (in new francs)	0.03	0.01	0.03	0.07	0.32	0.16

then the wet process is undoubtedly advantageous. In particular, costs must be taken into account, including not only the capital cost but also working costs. Furthermore, all the additional outgoings must be considered which differ very considerably from one plant to another. According to L. Septier[2], for an output of 110,000 Nm^3/hour, the costs are as shown in Table 3. These are valid only for the actual dust extracting equipment and do not include all ancillary costs. According to other documents, the costs of the wet process (Venturi scrubbers, disintegrators) exceed the figures given in Table 3, taking into account all the additional outgoings, including the settling and filtering equipment for dust recovery purposes.

A new cost comparison which was made on the occasion of an investigation in regard to the extraction of brown fume gave the following result:

Bag filter, 1;
Venturi scrubber, 1.15 to 1.35;
Dry electrostatic precipitator, 1.25;
Wet electrostatic precipitator, 1.6.

The plant costs of the bag filter, which are the lowest, were taken as a reference basis. Precisely in this case, the low initial cost of the Venturi scrubber is weighted by heavy outgoings for sludge treatment and dust recovery. Similar relationships between bag filters, and dry and wet electrostatic precipitators are disclosed by the data of K. Guthmann[1].

In order to make a complete costing comparison, it is also necessary to take into account amortizations, which are not equally large for all installations. In this respect, the dry methods are the most favourable.

In a French steelworks operating with oxygen lance, at present, with the support of the European Coal and Steel Community, a dust-extracting installation of Prat-Daniel design is in operation. The extraction of the brown fume is obtained using an accumulator similar to a blast heater. This consists of a tower filled with broken firebrick for cooling the hot waste gases so that a considerably smaller volume of waste gas remains than in the case of water cooling. At the end of the refining time, the heat accumulator is again cooled by cold air. Experiences in ferro-alloy furnaces provided the impetus for this solution. If, instead of using this heat accumulator, it was desired, for instance, to cool exhaust gases from 600 to 200 deg. C. in a spray cooler, then the dilution rate would be about 200 g./water/Nm^3 exhaust gas, the volume of exhaust gas to be cleansed being increased thereby by 25 per cent. The increased cost for the dust extracting plant would be greater than the cost of a heat accumulator, the economy of which would be still more evident if cooling were performed with infiltrated air. Furthermore, the end dew point of the gas is reduced so that there is less danger of condensation. The heat accumulator has the further problem of stabilizing the temperature and preventing any abrupt jump which might be dangerous for the filter, always dependent on how far the inertia of the monitoring equipment delays the action of the temperature control at the filter inlet. The heat accumulator is thus also a safety and protective element for the bag filter, which (behind the heat accumulator) is connected to a cooling tower with water spraying. Complete absence of colour in the gas passing out into the atmosphere is guaranteed.

The same dust-extracting equipment is also suitable for arc furnaces using an oxygen lance, since in this case it is possible to take the bag filter into service only during the refining period and then to cool with fresh air if exhaust gases are produced containing little dust.

A pilot plant for 7,000 to 8,000 m^3./hr. has been in service for several months on an 8,000-kVA arc furnace. It consists of a bag filter behind a heat accumulator without the usual additional cooling by water spraying. The exhaust gases are taken from the furnace through a pipe in the roof, the distance of the suction pipe above this column being variable and the infiltration of air is thus controllable so that the gas temperature can be kept within acceptable limits. During refining, the temperature in front of the accumulator tower rises to 350 to 400 deg. C. The oxygen blow lasts from 7 to 9 min. On leaving the cooling accumulator, the exhaust gas temperatures are 60 deg. C. at the start of the refining period with oxygen and between 80 to 140 deg. C., at the end. The temperature at the filter input is below 120 deg. C.; the filter fabric can withstand 140 to 150 deg. C.

The extraction rate of the filtering installation is nearly 100 per cent. of the dust content at the filter inlet, with 10 to 20 g./Nm^3 and the exhaust gas leaving the filter is colourless.

Summary

The nature of the fume from arc furnaces makes its cleaning a very difficult problem. The equipment for obtaining satisfactory dust extraction is very expensive, particularly in the case of furnaces working with oxygen.

Good experiences have been reported with bag filters made of synethtic fibres, the expense of which is not greater than that of other methods, even if capital and working costs are taken into account. Furthermore, with this method, the separated iron-oxide dust can be recovered dry and returned directly to the production process.

The dust extraction costs can be lower in certain cases, if there are several arc furnaces, since the cleaning of the exhaust gas can be restricted to the times when oxygen is added, which are characterized by large volumes of exhaust gas. In such case, one gas-cleaning installation will suffice for several furnaces.

The extraction of dust from the fume in arc furnaces should be regarded as a joint problem for furnace designers, steelworks engineers, and gas cleaning experts. The designers must adapt the furnaces to the need for collection and leading off the exhaust gas and devise suitable means of collection when building the furnaces in order to enable either the fitting of suction hoods or direct extraction in the roof. In the latter case a means of strengthening the roof must be found, so that its life is not shortened by the presence of the opening for carrying off the exhaust gas.

The steelworks engineers must consider the need for ventilating the shops and the installation of gas cleaning equipment and must do this when planning the position for the furnace.

The high aspirations and statutory requirements in regard to the prevention of atmospheric pollution inside and outside the works call for installations which will be reliable in operation and efficient, so presenting a task for the gas-cleaning experts, to suggest suitable devices, bearing in mind the location of the works and local working conditions.

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Resin-bonded Fabric Bearings for Atomic Power Stations

NUCLEAR engineering developments have introduced new problems in bearing design, requiring materials which can withstand heavy radiation, operate without oil or grease lubrication, and remain unaffected by immersion in "pond" water.

United Coke & Chemicals Company, Limited (branch of the United Steel Companies, Limited), has developed a new addition to its range of Orkot resin-bonded fabrics for this application. Known as Orkot Grade TL, it has undergone extensive radiation exposure and aqueous immersion tests and has been specified for the bearings for the fuel element handling equipment at both Hinkley Point and Sizewell atomic power stations.

The new material is tough, hard wearing, and has a low coefficient of friction with aqueous lubricants. For dry running conditions, it is available impregnated with graphite or MoS_2. Grade TL is dimensionally stable in the presence of water and has a remarkably high resistance to radiation damage, as the following details show, the dosage (megarads) being followed (in parentheses) by the change in edgewise compressive strength (per cent.):—100, +45; 300, +22; 1,000, −17. Other mechanical properties of interest are:—Compressive strength (flatwise), 49,000/sq. in.; compressive strength (edgewise), 15,000/sq. in.; impact strength, 20 ft./lb./in.; flexural strength, 10,500/sq. in.; flexural modulus, 0.5 by 10^6/sq. in.

THE National Malleable & Steel Casting Company, of the USA, is to provide financial and technical aid to Metalúrgica Peruana, of Lima, for the installation of a foundry for iron, steel, and non-ferrous metal products. The foundry will have an initial output of 20,000 tons a year, for use by industry, the mines, and the railways, according to the Bank of London & South America.

FORTHCOMING EVENTS

OCTOBER 2

Institute of British Foundrymen (Sheffield and District Branch):—President's dinner at the Sheffield and Eccleshall Restaurant, Eccleshall Road, Sheffield 11, at 7 p.m. Presidential address by R. V. Riley.

OCTOBER 3

Institution of Engineers and Shipbuilders in Scotland:—Meeting at 39, Elmbank Crescent, Glasgow, C.2, at 6.30 p.m. Presidential address: "In Search of Economic Stability and Security," by I. M. Stewart.

Combustion Engineering Association (Western Region):—Meeting at the Park Hotel, Cardiff, at 10 a.m. "The Factories Acts in Relation to Boilers and Pressure Vessels," by H. Entwistle, HM Engineering Inspector of Factories.

Institution of Plant Engineers (Peterborough Branch):—Meeting at the White Lion Hotel, Church Street, Peterborough, at 7.30 p.m. "Factory Redeployment for Alternative Production," by a representative of Thos. W. Ward, Limited.

OCTOBER 4

Institution of Production Engineers (Nottingham Section):—Meeting at Nottingham Reform Club, Victoria Street, Nottingham, at 7 p.m. "The Application of Spark Machining to Die Making in Different Industries," by J. P. Blackshield.

OCTOBER 5

Institution of Electrical Engineers:—Meeting at Savoy Place, London, W.C.2, at 5.30 p.m. Inaugural address as president by G. S. C. Lucas.

OCTOBER 7

Mining Institute of Scotland:—Visit to the Flemington electrical works, near Glasgow, of Anderson, Boyes & Company, Limited.

OCTOBER 9

Institution of Production Engineers (Manchester Section):—Meeting at Manchester College of Science and Technology, Sackville Street, Manchester, at 7.15 p.m. "Spark Machining and Similar Processes," by K. Appelbee.

Institute of Marine Engineers (West of England Section):—Meeting at the Small Engineering Lecture Theatre, University of Bristol, University Walk, Bristol 8, at 7.30 p.m. "Water Treatment for High-pressure Marine Boilers," by Dr. T. V. Arden and F. C. Blight.

National Association of Colliery Managers

OCTOBER 4

Scottish Branch:—Meeting at the Royal College of Science and Technology, Glasgow, at 5.15 p.m. Address by F. Vinck, director general of administration, European Coal and Steel Community.

OCTOBER 17

Yorkshire Branch:—Meeting at Kellingley Colliery at 3 p.m. Visit to the new mine, followed by presidential address by F. Fairclough.

OCTOBER 25

Lancashire Branch:—Meeting at the Manchester Literary and Philosophical Society, 36, George Street, Manchester, at 4 p.m. R. H. Clough, HM Divisional Inspector of Mines, will introduce his report on the North Western Division for 1960.

OCTOBER 27

North of England Branch:—Annual dinner.

Steel Tube Production in Japan

STEEL tube production in Japan rose by 34 per cent. in 1960 to 1,170,000 tons, and exports were up by 16 per cent. at 193,756 tons, according to a report from Düsseldorf. Chief destinations were the United States (127,408 tons), India (36,140 tons), and the Philippines (21,786 tons), followed by Thailand, Australia, Burma, Malaya, and Indonesia.

The relatively high proportion of welded tubes in total production is due to the considerable expansion of welded tube capacity carried out in recent years, particularly by Nippon Kokan and Sumitomo Metals. By 1964 Nippon Kokan is planning to build a new tube works at Kawasaki to raise its welded tube capacity to nearly 700,000 tons, while the Kobe Steel Company is to increase its capacity by 170,000 tons to 300,000 tons by 1965.

SYMPOSIUM ON

"Ferro-Alloy Industry in India"

ORGANIZED by the National Metallurgical Laboratory, Jamshedpur, a symposium on the "Ferro-alloy Industry in India" is to be held at the NML next February. Although the growth of the ferro-alloy industry and the developments in the production technology of ferro-alloys have been rapid and far reaching, they have been relatively slow in their impact in India and quite disproportionately so in relation to the projected developments in carbon, alloy, and special steels production targets of the Second and Third Five-year Plans.

The ratio of alloy, tool, and special steels to those of carbon steels is usually between 5 and 15 per cent. On this basis the 10,000,000 ingot tons of steel target per year projected at the end of the Third Five-year Plan will require output figures of 500,000 to 1,500,000 tons for alloy, tool, and special steels, which, in turn, will demand requisite indigenous availability and production of ferro-alloys both in terms of production figures and range of quality output.

At present, only ferro-silicon and standard high-carbon grade of ferro-manganese are being commercially produced in India—beyond this there is hardly any industrial scale indigenous production of other high-grade ferro-alloys. Substantial indigenous resources, however, exist for undertaking industrial-scale production of different types of ferro-chromium, ferro-titanium, ferro-vanadium, ferro-phosphorus, electrolytic manganese and chromium, and other nitrided and/or low-carbon ferro-alloys.

The National Metallurgical Laboratory has embarked upon some major research and development projects to study the amenability of Indian raw materials for the production of a diverse range of ferro-alloys to exacting specifications and needs based on the applications of latest metallurgical techniques to yield economical production desiderata. A pilot smelting submerged electrode Birlefco electric arc furnace with a capacity of 1 ton of ferro-alloy per day is also being installed at the NML and this will be available for the first time in India for pilot smelting of ferro-alloys. This pilot ferro-alloy furnace is expected to be inaugurated during the symposium session.

The scope of the symposium will broadly cover the following:—Survey of raw materials in terms of metallurgical quality and reserves for the production of different types and grades of ferro-alloys in India, including auxiliary requirements such as fluxes, fuels, electric power, transport, etc.; beneficiation of raw materials for indigenous ferro-alloy industry based on physical, chemical, and thermal beneficiation techniques and ore-dressing cycles, formulation of optimum flow-sheets and assessment of recovery yields and economics data; evaluation of electro-thermal, alumino-thermic, pyro-metallurgical techniques, and other specific processes and developments in the production of different types and grades of ferro-alloys in relation to the possibilities of their applications in India in the context of indigenous resources; study of the basic physico-chemical and thermo-dynamic principles involved in the production of ferro-alloys, including theoretical studies on slag and metal equilibria and related fundamental hypotheses; latest advances in the production technology of ferro-alloys considered in relation to laboratory scale, pilot plant, and industrial prototype production trials; utilization of by-products obtained in the ferro-alloy industries and overall economics of integrated production cycles; standard specifications for different grades of indigenous ferro-alloys based on corresponding specifications of the raw materials needed; present status of the ferro-alloy industry in India and future expansion plans thereof to be projected during India's successive Five-year Plans in the general background of world production trends.

Invitations are being extended to technologists, metallurgists, and research scientists in India and abroad to attend the symposium and contribute technical papers for discussion. The symposium will provide an international forum for establishing personal contacts and facilitating exchange of ideas on the development of ferro-alloy industry in general and that of India in particular.

American Test for Sheffield Steel

SUCCESSFUL fatigue test has been run at Lehigh University, Pennsylvania, on a $1\frac{1}{8}$-in. Macalloy bar with rolled thread anchorages. The test bar, supplied from Sheffield, was from a normal cast of steel and had a rolled thread at each end. A stress range of 85,000 to 100,000 lb./sq. in. was applied through the rolled thread anchorages to the bar for 3,000,000 cycles without failure. This compares with the recommended prestressing force after losses of 80,000 lb./sq. in.

The assembly was then taken out of the fatigue testing machine and tested to destruction, when it gave a strength of 143,000 lb. The specified ultimate stress for Macalloy steel is 143,000 to 161,000 lb./sq. in.

THE Mitsubishi Metal Mining Company and Mitsubishi Shoji Kaisha have applied for permission to import capital into Chile amounting to US $640,000 in the form of machinery and equipment to increase production at the iron-ore mine of the Compañía Minera Atacama, a subsidiary of Mitsubishi, of Japan.

Mr. W. J. Adcock

Safety in Relation to MODERN FORMS OF SUPPORT

Mr. H. Cunliffe

by W. J. Adcock* and H. Cunliffe†

In this paper, which was presented at the 1961 annual conference of the National Association of Colliery Managers, held in Edinburgh from June 6 to 8, the authors state: "We have seen that when the most modern support technique, in the form of power-operated supports, is applied to the face accidents occurring from falls of ground are virtually eliminated, but that another type of accident immediately takes its place." They urge that management at all levels must ensure that every under-offiial using these modern supports and support systems fully understands them, and that a support system once it has been agreed, is rigidly applied at all times.

THE last 10 years have seen a revolution greater than that of any previous decade in the methods and techniques of coal getting at the face. In 1947, some 2.5 per cent. of the annual output of deep-mined coal came from mechanized longwall faces. By 1954, the annual mechanized output had risen to 18,000,000 tons, representing some 8 per cent. of the total. Since then, the increase in coal-face mechanization has been even more rapid, and by the end of 1960, 83,000,000 tons, representing some 38 per cent. of the total, came from this type of face. This trend will continue, an increasing proportion of the national output coming from highly mechanized faces equipped with power-operated support systems.

Coincident with the new forms of mechanization, and forming an essential part of them, has been the introduction of new types and systems of support. The Meco-Moore loader—the first power loader to go into general use in British mines—was designed for operation with a conventional roof support system, using rigid steel props and corrugated benk bars, the coal being filled by the machine on to a belt conveyor. The introduction in 1947 of the Panzer Forderer conveyor and the associated prop-free front system, in which support is concentrated on the goaf side of the conveyor, represented a big step forward and widened the field of coal-face mechanization. The majority of power loaders currently in use require a prop-free front system of support for their operation; this almost certainly implies narrow strip mining, in which a number of strips from 6 in. to 2 ft. 6 in. may be taken each shift, and rapid rates of face advance. If the advance of the support system is to keep in step with the advance of the power loader, therefore, the supports used must be capable of being withdrawn and reset quickly and easily, and the manpower required to advance them must be kept to a minimum consistent with efficient working.

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Props

Obviously, under these conditions, the rigid steel type of prop is no longer applicable and they have had to be replaced by yielding type props, adjustable in length and incorporating means for applying a pre-load, and for rapid, easy, and safe release to facilitate withdrawal at the waste edge.

The two main types of yielding prop available,

TABLE 1.

	Hydraulic yielding props.		Mechanical yielding props.	
	Number (in thousands).	Percentage of total.	Number (in thousands).	Percentage of total.
1951 ..	19	1	15	1
1952 ..	48	2	44	1
1953 ..	104	3	85	3
1954 ..	192	5	109	3
1955 ..	272	8	115	3
1956 ..	375	11	118	3
1957 ..	579	17	149	4
1958 ..	719	21	175	5
1959 ..	759	24	169	5
1960 ..	819	28	182	6

the hydraulic and the mechanical or friction type, have been described many times before and need no further introduction. Table 1 shows their rate of application in British mines between 1951 and 1960.

It is interesting to note that the first prototype hydraulic props were introduced underground in the early part of 1946. They now represent some 30 per cent. of our total usage of coal-face supports, and are used both on mechanized and hand-got faces.

Bars

In the prop-free front system of support the bars required to provide adequate cantilever support over the conveyor track are equally important.

It is obviously desirable to use bars which are much stronger than the normal corrugated steel bar, which has no appreciable strength in cantilever, accepting on average only half a ton for 1 in. of deflection with 1 ft. 9 in. of cantilever. In consequence, hinged cantilever bars of continental design were introduced. These are usually of box or " H " section, constructed in a high grade of steel, each bar being provided with a form of hinge or coupling. In this group the slimmest bar available, the Groetschel K56, which is only 2¼ in. deep, takes a load of slightly more than 1 ton for 1 in. of deflection, with some 60 in. of cantilever, including the joint.

Table 2 shows the rate of application of timber, rigid steel, and linked bars between 1951 and 1960.

TABLE 2.—*Roof Bars at the Working Face: Numbers in Use or Waiting to be Set or Reset (as at June 30, each Year).*

MILLIONS.

Year.	Type of bar.			
	Timber.	Rigid steel.	Linked.	Total.
1951 ..	0.47	1.14	N.A.*	—
1952 ..	0.44	1.11	0.03	1.58
1953 ..	0.42	1.20	0.05	1.67
1954 ..	0.41	1.19	0.09	1.69
1955 ..	0.40	1.20	0.12	1.72
1956 ..	0.42	1.16	0.16	1.74
1957 ..	0.39	1.14	0.24	1.77
1958 ..	0.38	1.11	0.30	1.79
1959 ..	0.33	1.04	0.31	1.68
1960 ..	0.27	0.98	0.34	1.59

* Not available.

Many mining engineers expected that the new support techniques would result in greater safety and a reduction in the number of accidents from falls of ground, for the following reasons:—

1.—Mechanization had taken the form of narrow slice machines with more continuous mining, and it was thought that this would be less destructive to the roof than conventional longwall mining with undercutting machines and associated shot-firing.

2.—Improved types of support were being employed. They were regarded as improved in the following respects:—

(*a*) Props could be set with an initial resistance, so that roof lowering would be reduced.

(*b*) They were designed to yield, so that they would not fail by breaking or bending, as did wooden and rigid steel props, and to avoid damage to the roof or floor by excessive resistance, as did the rigid type of support.

(*c*) They were expected to provide more uniform resistance, a feature that had been thought for many years to be an advantage. It was soon recognized, however, that where the floor strength was less than the resistance of the prop the supports might still not give uniform resistance. It was also noted that the resistance offered by friction props was variable depending upon the condition of the prop and the tightness of the wedge. Nevertheless, it was felt that yielding props as a whole gave more uniform resistance than did previous types of prop.

(*d*) The hydraulic prop could be withdrawn from a remote, safe position and, while the friction prop cannot so easily be withdrawn from a remote position, they are set close together and thus the risk during withdrawal appeared at least not to have been increased compared with the old types of support.

(*e*) Linked bars were employed which were stronger than corrugated straps and wooden bars, although admittedly the joints were not always very strong.

(*f*) Power-operated supports have come into use more recently and, because of their importance, will be considered in a separate section.

3.—Men spend less of their time under unsupported roof. On hand-filled conventional faces the fillers inevitably spend most of their time shovelling at coal which is beyond the supports. They are expected to set temporary props 3 ft. in advance of the front props, so that they are never far from protection, but reports of accidents show that they are sometimes injured by falls when the earlier setting of supports would have prevented the accidents. On a mechanized prop-free front face most of the men spend all their time under roof that is very closely supported. A few of the men, of course, have to go on the face side of the conveyor to work, and these men are subjected to much the same risks as those on conventional faces. Methods of providing protection to these men will be discussed later.

4.—The new trend in mechanization has provided a stimulus to increased caving. It is arguable at this stage whether this has increased safety in total. Caving in the wrong conditions can give rise to bad roof and, therefore, to increased danger. There are so many faces which are successfully caved, however, and in respect of which some observers say that the system has improved conditions, that caving, in the opinion of the authors, has not in general caused worse roofs than existed formerly. On the other hand, caving eliminates those not infrequent accidents caused when men venture into the waste for packing material. Moreover, according to the report of the Chief Inspector of Mines for 1959, there are some grounds for thinking that accidents during withdrawal at the waste edge are fewer with caving than with strip-packed conditions. Caving is not, of course, a modern form of support. Its rate of application has grown in the last seven years, however, as is shown in Table 3,

and it has grown perhaps as much as anything because modern forms of support have made caving practicable in places where it would not otherwise have been so.

TABLE 3.—*Systems of Waste Support, showing the Percentage of Total Waste Length Supported by the Various Means as at June 30, each Year.*

Year.	Solid packing.	Strip packing.	Total caving.
1954	5.3	75.7	19.0
1955	5.0	75.0	20.0
1956	4.6	73.3	22.1
1957	4.1	70.8	25.1
1958	4.2	68.6	27.2
1959	3.7	67.9	28.4
1960	3.8	63.4	32.8

A review of available statistics shows that caving is more common on mechanized faces. As will be seen from Table 3, the overall percentage of caving was 32.8 in June, 1960, whereas this percentage rises to 50 if only mechanized faces are considered.

Accident Trends

It is possible to prove statistically that the introduction of the new types and systems of support has made a marked contribution to face concentration and productivity, but it is more difficult to assess what contribution, if any, they have made towards increased safety.

Table 4 shows the number of men killed and seriously injured by falls of ground at the face and in roadways for the years 1951 to 1960.

It will be seen that although there has been a reduction in the total number of accidents, there has been little change in the accident rate.

TABLE 4.—*Accidents from Falls of Ground (National).*

Year.	At face.				In roadways.			
	Killed.		Seriously injured.		Killed.		Seriously injured.	
	Number.	Rate.*	Number.	Rate.*	Number.	Rate.*	Number.	Rate.*
1951	162	0.13	659	0.50	29	0.02	64	0.05
1952	156	0.12	717	0.53	25	0.02	68	0.05
1953	154	0.12	654	0.49	20	0.01	62	0.05
1954	159	0.12	615	0.46	16	0.01	51	0.04
1955	152	0.12	599	0.45	19	0.01	56	0.55
1956	134	0.10	528	0.40	21	0.01	50	0.04
1957	148	0.11	561	0.63	15	0.01	44	0.03
1958	130	0.11	625	0.50	18	0.01	54	0.04
1959	129	0.11	632	0.55	11	0.01	71	0.06
1960	108	0.10	583	0.55	16	0.02	48	0.04

* Rates per 100,000 underground manshifts worked; not face manshifts only.

TABLE 5.—*Powered Roof Supports.*

Type.	1958.		1959.		1960.	
	Installations.	Units.	Installations.	Units.	Installations.	Units.
Gullick Seaman (full face)	4	562	15	1,719	49	4,249
Gullick Seaman (waste edge)	11	881	34	2,569	32	2,431
Dowty Roofmaster	10	1,088 (prs.)	16	1,624 (prs.)	30	3,458 (prs.)
Dobson	2	156	3	250	9	1,104
Desford/Tandem	1	Experimental quantity	2	135	2	271
	1 (partial)					
Total	28	2,687	70	6,297	122	14,513

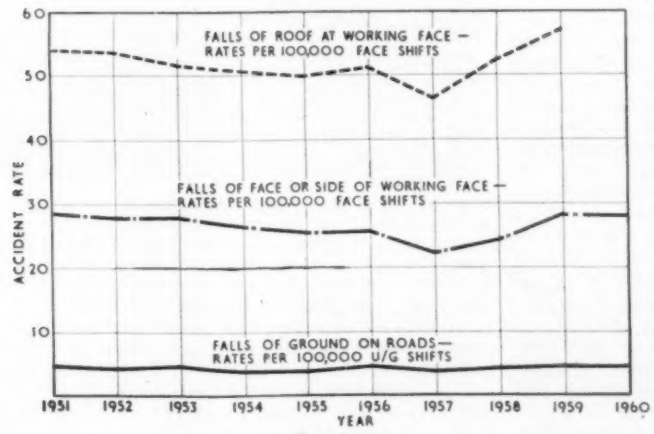


FIG. 1

In view of the fact that most of the expensive new support equipment is used on the coal face, the roadway accident trend acts as a control, and indicates whether influences not perhaps connected with modern forms of support at the face are affecting accident trends.

Table 4 covers the period during which (as is shown in Table 1) there has been a major increase in the application of the new supports and support systems on the face. It shows the normal fluctuations that are always apparent in accident trends, but no marked improvement, or otherwise, in rates either at the face or in the roadways.

The overall accident rates from

TABLE 6.—*Accidents on Faces from Falls of Ground.*

Face/support classification.	Fatal.								Serious reportable.							
	Number.				Rate per 100,000 face manshifts.				Number				Rate per 100,000 face manshifts.			
	1957	1958	1959	1960	1957	1958	1959	1960	1957	1958	1959	1960	1957	1958	1959	1960
POWER-LOADED FACES:																
Falls of roof	16	21	24	25	0.18	0.19	0.23	0.21	60	69	76	86	0.67	0.68	0.71	0.72
Falls of face or side ..	11	4	2	4	0.12	0.04	0.02	0.04	37	60	56	71	0.41	0.58	0.52	0.59
Total falls	27	25	26	29	0.30	0.23	0.25	0.25	97	129	132	157	1.08	1.26	1.23	1.31
FACES WITH HAND-LOADING ON TO AFCs*:																
Falls of roof	1	4	3	1	0.10	0.47	0.32	0.12	4	2	6	8	0.40	0.24	0.65	0.96
Falls of face or side ..	1	—	1	—	0.10	—	0.11	—	6	—	3	5	0.61	—	0.32	0.60
Total falls	2	4	4	1	0.20	0.47	0.43	0.12	10	2	9	13	1.01	0.24	0.97	1.56
OTHER FACES:																
Falls of roof	96	86	83	69	0.18	0.19	0.20	0.20	235	273	272	237	0.45	0.59	0.66	0.70
Falls of face or side ..	25	19	19	9	0.05	0.04	0.05	0.03	230	223	228	176	0.44	0.47	0.55	0.52
Total falls	121	105	102	78	0.23	0.23	0.25	0.23	465	496	500	413	0.89	1.06	1.21	1.22
Total falls all faces ..	148	130	128	108	0.24	0.23	0.25	0.23	562	625	632	583	0.92	1.10	1.22	1.25
POWERED-SUPPORT FACES:																
Falls of roof	n.a.	n.a.	n.a.	3	n.a.	n.a.	n.a.	0.21	n.a.	n.a.	n.a.	9	n.a.	n.a.	n.a.	0.62
Falls of face or side ..	n.a.	n.a.	n.a.	—	n.a.	n.a.	n.a.	—	n.a.	n.a.	n.a.	14	n.a.	n.a.	n.a.	0.97
Total falls				3				0.21				23				1.59
OTHER PROP-FREE FRONT FACES:																
Falls of roof	6	14	14	12	0.11	0.19	0.18	0.17	27	38	49	39	0.48	0.53	0.62	0.54
Falls of face or side ..	5	2	1	3	0.09	0.03	0.01	0.04	20	38	36	40	0.36	0.52	0.47	0.55
Total falls	11	16	15	15	0.20	0.22	0.19	0.21	47	76	85	79	0.84	1.05	1.09	1.09
NON-PROP-FREE FRONT FACES:																
Falls of roof	106	93	93	80	0.19	0.19	0.21	0.21	268	304	299	283	0.48	0.61	0.68	0.74
Falls of face or side ..	31	21	20	10	0.06	0.04	0.05	0.03	247	245	248	198	0.44	0.49	0.56	0.52
Total falls	137	114	113	90	0.25	0.23	0.26	0.24	515	549	547	481	0.92	1.10	1.24	1.26

* Prior to 1960 these figures are included in "Other Faces."
n.a. indicates figures not separately available.

falls of ground (total killed and injured) for the period 1951/1960 broken down into (*a*) falls of roof at working face, (*b*) falls of face or side at working face, and (*c*) falls of ground in roadways, are shown in graphical form in Fig. 1. This again emphasizes that there has been no substantial improvement, which, in view of the increased cost of these systems, is very disappointing.

In order to examine further the coal-face accident figures, Table 6 was prepared, giving a detailed analysis of accidents (fatal and serious reportable) for the years 1957/1960, according to the method of working and the system of support. Unfortunately, the figures relating to faces equipped with power-operated support systems are only available for 1960, so that it is not possible to make direct comparison.

Safety Problems

Having examined the accident trends, it might be useful to examine the safety problems involved. From a safety point of view, a number of problems arose following the introduction of the prop-free front system of support. Of these problems, perhaps the most important has been that of setting the cantilever bars, which in some cases are so heavy that two men are required to set them. To eliminate the need for men to go on to the face side of the conveyor or to stand precariously on the spill plate, efficient bar setting devices have been developed which enable one man to set a bar in cantilever from the goaf side of the conveyor. Figs. 2 and 3 show examples of these devices. The wider application of them should be encouraged and should result in a reduction in the number of accidents occurring when slines of coal fall from the face.

Another problem has been that of protecting workmen filling the small coal left behind by some types of power loader. The exemptions granted by the Inspectorate under the terms of the Mines and Quarries Act, 1954, and the Coal and Other Mines (Support) Order, 1956, require that before men work or pass on the face side of the conveyor with a prop-free front system of support, temporary supports must be set. Unfortunately, on power-loaded faces workmen often omit to set these temporary supports when they are working on the face side of the conveyor, on the assumption that the permanent supports are likely to be set very quickly and that the cantilever bars provide adequate protection. From the roof control aspect this problem can be overcome by the use of lightweight, easily handled, temporary props, and two of the hydraulic support manufacturers have developed hydraulic props for this purpose.

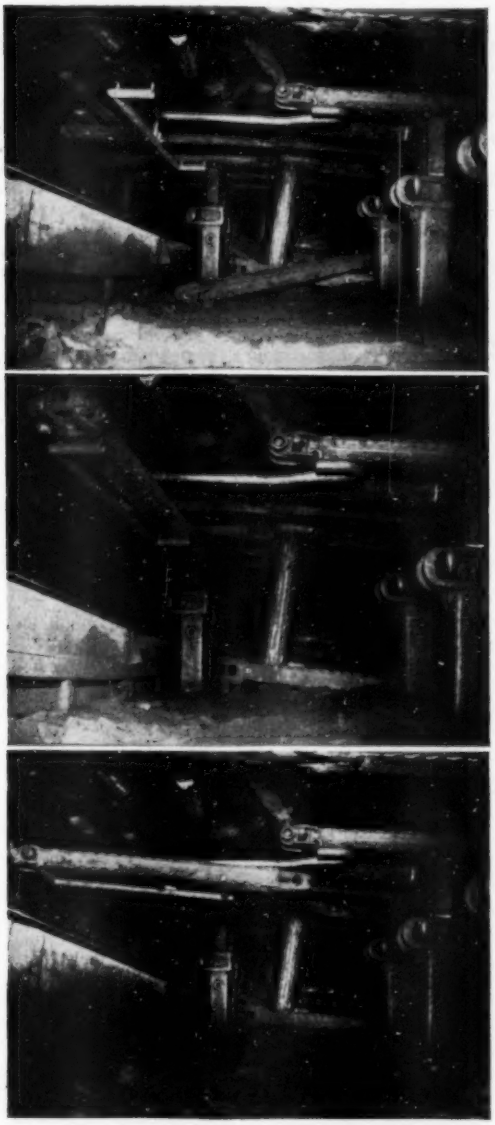


FIG. 2.—GROETSCHEL BAR-SETTING DEVICE.

The Dobson lightweight prop has a resistance of 10 tons, and a prop of 3 ft. 6 in. maximum height with 10 in. of hydraulic travel weighs 37½ lb.

The Dowty Hydropost (Fig. 4) has a resistance of 8 tons, a prop of 3 ft. 10 in. maximum height with 9 in. of hydraulic travel weighing only 34 lb. In addition, there are mechanical and screw jack props available. More recently, however, a tubular sprag has been developed which, in addition to stopping slines of coal falling from the face, provides a measure of effective support between roof and floor (Fig. 5). In its laboratory tests at Bretby, a resistance of 7 tons between roof and floor induced a load of 5.6 tons on the face pad. Unfortunately, the operational trials of this device have not been wholly successful, but the design is interesting and perhaps merits further development.

A number of persons are killed and seriously injured each year by falls at the waste edge during the withdrawal of supports, and, as has already been stated, there is evidence to suggest that the wider application of caving will result in a reduction in the number of this class of accident. It has been suggested that the reduced accident risk is due to the fact that on caved faces withdrawal of supports is a carefully planned operation. It is obvious that for a number of years we shall have a large number of faces which are strip packed: it is equally important, therefore, to ensure that the system of withdrawal laid down in the Managers' Support Rules is strictly complied with and that workmen are not allowed to return to a partially drawn off waste edge to recover a prop or bar.

Another area where particular care is needed, especially on a mechanized face, is the roadhead and stablehole area, where the accident risk is high because of concentration of manpower and where lateral strata movement is heavy. Table 7 shows a breakdown of accidents in this area for the years 1957 to 1960. It is general practice to use I-section girders at the roadhead, set either at right angles or parallel to the face. This form of section is particularly weak and unstable, due to its liability to fail in torsion, especially when the bar is set on its side. The instability of the I-section girder is accentuated when set parallel to the face, where it is subject to maximum differential lateral movement between roof and floor, and the instability is further increased if the girders are set on rigid supports which are not capable of preload, offering resistance only as strata convergence and fracture takes place. This resistance may become so great as to buckle the web of an I-section girder.

In an attempt to increase support stability and safety in this area, special box-section bars have been designed by SMRE for use at roadheads (Fig. 6). In use underground these bars have been proved far superior to the I-section girders both in strength and stability, and although initially the girders cost more, the increase in life over that of the I-section girder makes their use an attractive and economic proposition. For example, in the acceptance trials of these bars, which were conducted in the East Midlands, West Midlands, and North-Eastern divisions, the SMRE bars were in use for periods of 10/12 months without replacement, during which time the bars at other roadheads of the face were replaced many times. It is suggested that the wider use of this type of bar in conjunction with preloaded, yielding props at the roadhead would result in an immediate decrease in the number of accidents in this area.

Where the seam height permits, it is advisable to

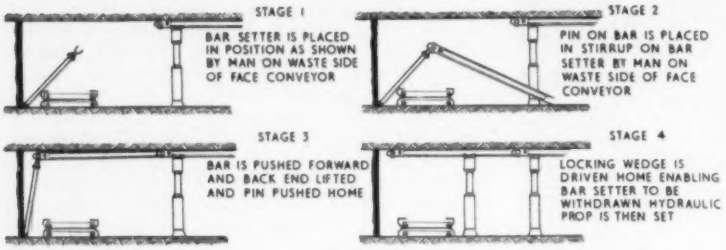

STAGE 1
BAR SETTER IS PLACED IN POSITION AS SHOWN BY MAN ON WASTE SIDE OF FACE CONVEYOR
STAGE 2
PIN ON BAR IS PLACED IN STIRRUP ON BAR SETTER BY MAN ON WASTE SIDE OF FACE CONVEYOR
STAGE 3
BAR IS PUSHED FORWARD AND BACK END LIFTED AND PIN PUSHED HOME
STAGE 4
LOCKING WEDGE IS DRIVEN HOME ENABLING BAR SETTER TO BE WITHDRAWN HYDRAULIC PROP IS THEN SET

FIG. 3.

use the bars set at right angles to the face lines, where they are not affected by lateral movement of the strata. In the thinner seams, this may prove impracticable with the majority of bars currently available, but a special thin section box type of bar has been developed for this purpose. This bar, the Groetschel K.45, is slightly under 2 in. deep and weighs approximately 12 lb./ft. run. In laboratory tests at Bretby, it was found to be twice as strong in cantilever as the W-section, 13 lb./ft. run bar (Fig. 7).

More recently, a power-operated system of road-head support developed by the board's own Mining Research Establishment at Isleworth has been undergoing operational trials. The prototype units were installed at a supply gate roadhead in the Little Woodfield Seam at Donisthorpe Colliery, where they were in use for some five weeks. Unfortunately, strata conditions at the time were particularly difficult and the results of the trial were, in consequence, somewhat inconclusive. The need for some modification was, however, apparent, and units modified in the light of this experience have been undergoing trial in the Silkstone Seam at Elsecar Main Colliery, in the North-Eastern Division. The results of this latest trial had not been fully assessed at the time of preparing this paper, but they were sufficiently encouraging to suggest that the design could form the basis of a

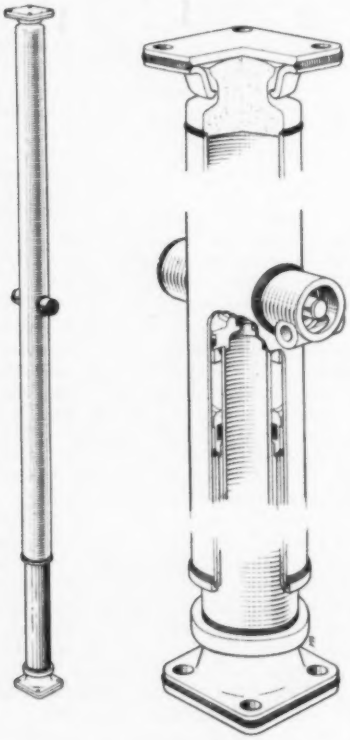


FIG. 4.—DOWTY HYDROPOST.

FIG. 5.—COCKERMEG SPRAG.

TABLE 7.—*Accidents at Roadheads from Falls of Ground.*

Face/support classification.	Fatal.								Serious reportable.							
	Number.				Rate per 100,000 face manshifts.				Number.				Rate per 100,000 face manshifts.			
	1957	1958	1959	1960	1957	1958	1959	1960	1957	1958	1959	1960	1957	1958	1959	1960
POWER-LOADED FACES:																(Fatal or serious)
Falls ahead of ripping:																
Roof	4	4	—	3	0.04	0.04	—		6	8	9	11	0.07	0.08	0.09	0.12
Face or side	1	—	—	—	0.01	—	—		1	13	2	4	0.01	0.13	0.02	0.03
Falls from ripping face (side)	4	—	—	2	0.05	—	—		12	14	11	13	0.13	0.13	0.10	0.13
Falls outbye ripping face (roof)	1	1	3	3	0.01	0.01	0.03		4	7	8	10	0.04	0.07	0.06	0.11
Total falls	10	5	3	8	0.11	0.05	0.03		23	42	30	38	0.25	0.41	0.27	0.39
FACES WITH HAND-LOADING ON TO AFCS:																
Falls ahead of ripping:																
Roof	Not separately available.			—	Not separately available				Not separately available			1	Not separately available			0.12
Face or side				—								—				—
Falls from ripping face (side)				—								—				—
Falls outbye ripping face (roof)				—								—				—
Total falls				—								1				0.12
OTHER FACES:																
Falls ahead of ripping:																
Roof	17	22	13	14	0.03	0.05	0.03		29	30	36	19	0.06	0.06	0.09	0.10
Face or side	3	2	2	2	0.01	0.01	0.00		18	19	31	21	0.03	0.03	0.08	0.06
Falls from ripping face (side)	10	7	8	5	0.02	0.01	0.02		50	42	52	33	0.09	0.09	0.12	0.11
Falls outbye ripping face (roof)	6	6	4	4	0.01	0.01	0.01		19	23	17	24	0.04	0.05	0.03	0.08
Total falls	36	37	27	25	0.07	0.08	0.06		116	114	136	97	0.22	0.23	0.32	0.35
Total falls all faces	46	42	30	33	0.07	0.07	0.06		139	156	166	136	0.23	0.27	0.31	0.36
POWERED-SUPPORT FACES:																
Falls ahead of ripping:																
Roof				—								1				0.07
Face or side				—								1				0.07
Falls from ripping face (side)				—								1				0.07
Falls outbye ripping face (roof)				—								—				—
Total falls				—								3				0.21
OTHER PROP-FREE FRONT FACES:																
Falls ahead of ripping:																
Roof				1								5				0.08
Face or side	Not separately available			—	Not separately available				Not separately available			1	Not separately available			0.01
Falls from ripping face (side)				1								7				0.11
Falls outbye ripping face (roof)				—								4				0.06
Total falls				2								17				0.26
NON-PROP-FREE FRONT FACES:																
Falls ahead of ripping:																
Roof				16								25				0.11
Face or side				2								23				0.06
Falls from ripping face (side)				6								38				0.12
Falls outbye ripping face (roof)				7								30				0.09
Total falls				31								116				0.38

Combined with "Serious Reportable"

prototype production model for extended underground trials in varying conditions.

Powered Supports

Despite the facility of use of hydraulic and mechanical yielding props it was soon evident that the speed of many of the power loaders and the rate of advance of faces was being governed by the speed at which the support system could be advanced with normal deployment of manpower at the coal face. This factor led to the development of power-operated support systems. The first true working support was introduced underground in 1949 at a colliery in Area 1 of the East Midlands Division. The unit was developed and produced by Dowty, but technically it was before its time. Very little success was achieved in the trial, and the design was abandoned.

This first venture was followed by a trial of the Bolton powered support in the Durham Division in conjunction with a plough. This design was also abandoned for various technical reasons.

The first and possibly the simplest of the power-operated support systems to go into general use was the Gullick Seaman chock system, effective support being maintained by a single line of hydraulic chucks set at 3-ft. to 3-ft. 6-in. centres along the goaf edge, the waste area being caved immediately behind the chock line. In chronological order, this development was followed by the Dowty Roofmaster, the Dobson Double II, and the Desford Goalpost systems. The design and operation of all these units has been described many times and they need no further introduction; it is sufficient to say here that at the end of 1960, 122 faces were supported by these supports, Table 5 giving details of their application by types.

To date, the setting and yield loads of power-

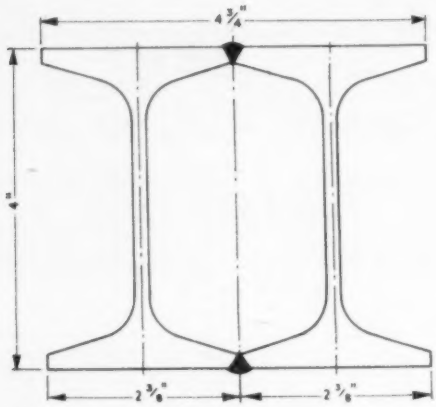


FIG. 6.—SPECIAL BOX-SECTION BAR, APPROXIMATE WEIGHT 16.5 LB./FT.

operated supports used have been arbitrary. Maximum setting loads have been based on a convenient hydraulic working pressure, and yield loads have been influenced by experience with individual hydraulic props. The speed and pressures at which power-operated supports are set can, in certain circumstances, cause serious shock loading of the adjacent strata, resulting in disintegration which would not occur with the more gradual build-up of resistance with a more conventional support system. Experience to date with these systems suggests that

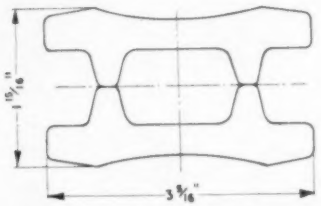


FIG. 7.—GROETSCHEL K45 BAR.

they function in a different way and have a different effect on the strata from a normal prop and bar system of support. Their application has, therefore, posed a number of new problems, and although there are currently available four approved types of support of basically sound design and despite the fact that there are now some 130 installations working, we still have much to learn about the application of this type of support.

As at present designed, the systems appear to provide less flexibility under certain abnormal strata conditions (for example, passing through faulted ground) than does a prop and bar system, and the problems and implications of changing from such a system to powered supports are not yet fully solved.

Although the application of power-operated support systems is now well established, experience to date has been with installations in level seam conditions. Recently, however, a face in a seam 4 ft. 6 in. thick on gradients varying from 1 in 2½ to 1 in 3 has been equipped with Gullick five-leg chocks fitted with special fenders to ensure alignment during advance. It is early yet to report on operational experience with this installation, but indications are that it will be successful, and if it is there is no doubt that the whole field of application for this type of support will be considerably widened. In addition, powered supports are now being used in seams as thin as 2 ft. 6 in. This itself represents a big step forward and again widens the field of application.

There can be no doubt that the introduction of these support systems represents a major technical advance and that they have contributed in a large measure to the increased concentration of face-working.

From the safety viewpoint the major advantages of powered supports would appear to be as follows:—

(*a*) In some conditions improved strata control at the face with, in consequence, greater safety and increased machine performance and improved productivity.

(*b*) A substantial reduction in the number of men required for the advance of the support system. Assuming the same accident risk, the number of accidents should be reduced.

(*c*) The almost complete elimination of the human element from the setting of supports, the performance of the whole face support system being dependent on mechanical factors.

(*d*) Support losses being practically eliminated, there is less tendency to increase the distance between the supports because of losses.

(*e*) They reduce the amount of equipment and supplies to be handled from the gate on to the face.

(*f*) There is less risk when withdrawing these supports, as workmen are adequately protected from falling debris by a line of supports, thus eliminating what has been a continuing and prolific source of accidents ever since the introduction of rigid steel supports made prop withdrawal an essential element in the coal-face work cycle.

In practice, the number of accidents occurring on faces equipped with power-operated supports appears not to have been substantially reduced. This is shown in Table 6, but as these particular figures were only available for 1960, when the basis for them had not been settled or fully understood, the figures may not be wholly accurate.

A new type of accident appears to be occurring on these faces, however, not caused by falls of ground. For example, in one accident a man trapped his head between the bar of an advancing Roofmaster unit and the roof trimming jib of a trepanner. In two other cases workmen had their heads caught between the lowered roof bars of a powered support unit and the roof; when the bars were reset their heads were crushed. This sort of accident should not have happened and has no

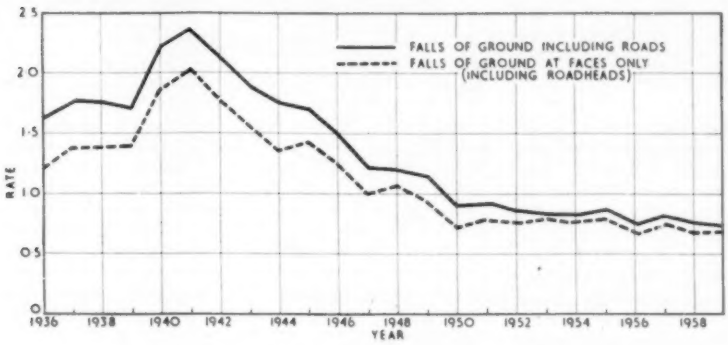


FIG. 8.—DEATH RATES PER MILLION TONS OUTPUT (FROM HM CHIEF INSPECTOR'S REPORTS).

bearing on the system of support in use on the face, but these accidents are happening and care must be taken to educate the workmen to see that their occurrence is minimized.

Although not falls-of-ground accidents, a number of accidents have also been caused by the transport of roof support equipment on Panzer Forderer conveyors. In one division there were no fewer than four fatalities in one year due to persons being caught by material being carried along on armoured conveyors. It is unfortunate that this type of accident has tended to increase and become typical of the use of this type of conveyor. Obviously, it is not possible to stop the transport of material by conveyor, but if the conveyor is used for this purpose thought and care must be taken. There must be a rigid observance of the signalling codes laid down by the manager and the complete prohibition of the lifting of props and bars from the conveyor by picking up the leading end. In one division a man was killed when passing a link bar across a moving conveyor, being struck a violent blow when one end of the bar was caught by a conveyor flight. This class of accident should be eliminated on faces equipped with power-operated support systems.

One of the problems that must be faced in the future is that of applying power-operated supports in seams of 30 in. and less, where travelling the face is difficult, where the handling of individual props presents a problem and hinders the steady progress of the power-loading machine, and where the accident potential is high. All the systems currently in use are activated by valves situated on the units themselves, an operator moving along the face advancing each unit in turn. This obviously presents less of a problem in a thin seam than does a normal prop and bar system, but travelling conditions can be difficult, and the advance of a manually controlled power-operated support system can still prove a bottleneck. The Mining Research Establishment has been examining the possibility of using remote-control systems in which the support system is advanced and reset from a point in the gate road leading to the face. Small-scale underground trials have been conducted with success, and it is hoped that within the next month or so an extended face trial will be carried out with Seaman Gullick chocks fitted with a similar type of valve. The scope of the experiment will be later widened to include a trial of chocks fitted with electro-hydraulic type valves.

Theoretically this development should result in a substantial reduction in the number of accidents on the face, but only time will show if this is a fact.

Approval and Acceptance

No paper on this vital question of safety would be complete without mention of the approval and acceptance scheme for adjustable coal-face roof supports, which was instituted by the National Coal Board in May, 1959. Under this system every item of face support, props, bars, chocks, and prop chocks, has to be subjected to a standard laboratory test procedure agreed between the board and the Ministry. Should these initial tests prove successful, they are followed by operational trials underground. At the satisfactory conclusion of these trials an approval number is granted to a support unit.

In this way the board ensures that only the best support equipment is purchased, and, should any failures occur, is able to take immediate action with the manufacturer to modify the design or the material specification so as to ensure that the failure is not repeated.

Conclusions

In the paper the authors have confined themselves to the consideration of the effects of the application of modern methods of roof support at the face, for it is here that the major problems lie. The tables and graphs have shown various accident rates on a manshift basis, but Fig. 8, which has been prepared from information given in the Chief Inspector's reports, shows death rates per million tons output between 1936 and 1956. It will be seen that the downward trend commenced in 1941, and it is surprising to note that since 1950 there has been no significant change in accident rates despite the increasing amount of money spent on support equipment.

In 1958, an examination of this problem was made in the East Midlands Division as part of an overall examination of the problems associated with increasing application of coal-face mechanization[1]. The divisional accident figures showed that there was a higher proportion of accidents on power-loaded faces in relation to the number of men employed, but that if the figures were considered on a tonnage basis the position was reversed. In

other words, the risk is less in relation to the quantity of coal produced, and there are fewer accidents on power-loaded faces than on hand-filled faces. This was confirmed in a recent paper[2] making a statistical review of accident trends in Yorkshire.

Despite increasing expenditure on supports, accidents from falls of ground still account for the majority of fatal and reportable accidents, and every effort must be made to obtain the safety dividends which can accrue from the use of the new supports. In assessing their value as a safety factor as opposed to an aid to production it must be remembered that without the yielding prop and link bar the application of the prop-free front would have been impossible. This system of support has in turn led to an increase in the application of caving as a means of waste support. It is possible that the accident risk over the past decade would have been greater had not these supports been introduced.

What lessons can be learnt from these accident statistics? We have seen that when the most modern support technique, in the form of power-operated supports, is applied to the face accidents occurring from falls of ground are virtually eliminated, but that another type of accident immediately takes its place.

It is suggested that one of the major factors to be considered in this connection is that of education. Management at all levels must ensure that every under-official and man using these modern supports and support systems fully understands them, and that a support system once it has been agreed is rigidly applied at all times.

Acknowledgments

The authors would like to thank the director-general of the Production and Reconstruction Department and the production director of the Scottish Division, respectively, for permission to publish this paper. The opinions expressed are those of the authors and do not necessarily represent the views of the National Coal Board.

REFERENCES

[1] Proceedings of a Symposium on Power Loading, 1958.
[2] Accidents in Coal Mines. J. Blunt. IRON AND COAL, March 3, 1961, p. 453.

Deep Mining of Lead and Zinc

On behalf of the US Bureau of Mines, engineers in the Coeur d'Alene region of Idaho are to conduct laboratory and field tests on rock pressures and ground-support problems associated with the deep-mining of lead and zinc. The effectiveness of pre-cast, segmented, reinforced concrete drift sets, explosive shaping of rock bolts to obtain rapid rock-bolt anchorage, and the factors affecting the ground support of hydraulic stope fill will be tested. Other mining research will seek ways to reduce costs and to increase the safety and efficiency of rock-drilling operations and the breakage of rock with explosives.

Water Range Conveyor Structure

MR. W. MIDDLETON, manager of Nook Colliery, North-Western Division of the National Coal Board, has devised a water range conveyor structure in which water is supplied to the spray heads through the tubular structure of the conveyor. Slung from the tubular members of the conveyor is a series of troughed idler pulleys; a series of return idler pulleys, affixed by brackets, is carried by the vertical tubular members of the conveyor framework. As is usual, the troughed idler pulleys support the conveying upper run of a conveyor belt, and the return idler pulleys support the return of the conveyor belt.

A pair of transversely spaced tubular members extending along the conveyor constitute a conduit for the supply of water to a number of spray heads located at stations spaced along the length of the conveyor. The spray heads are connected to the tubular members by conduits, each of which incorporates an on-off valve. Each valve is biased to its on position by a spring, but is normally retained in its off position by means of a fusible coupling connected to a pivotally mounted lever.

In the event of fire occurring on the lower run of the belt, the heat generated will fuse the coupling and thereby permit the spring to move the valve into its "on" position, when water in the tubular member will be supplied to the spray heads adjacent the respective fusible coupling through the conduits; water will thus be sprayed on to the seat of the fire.

Incorporated in the valve unit is an electric switch which, when the fusible coupling collapses, comes into operation and rings an alarm bell suitably sited at some transfer point or telephone exchange.

Antimony-clad "Nilo-K"

Johnson, Matthey & Company, Limited, London, E.C.1, can now offer to manufacturers of semiconductor devices sample quantities of "Nilo-K" strip clad on each side with 0.5 per cent. gold-antimony. It is hoped that production quantities will be available early next year. The strip is available in widths between $\frac{3}{32}$ in. (2.4 mm.) and 2 in. (50.8 mm.), in thicknesses down to 0.005 in. (0.13 mm.). The thickness of cladding that can be supplied on each face is either 11.5 or 18.75 per cent. of the total thickness.

Civil Engineering Films and Models

The Federation of Civil Engineering Contractors has prepared an up-to-date list of films and models available from its members. The list includes 111 films and 14 models of many of the varied activities of the civil engineering contracting industry, including harbours, roads, bridges, airports, power projects, oil refineries, water supply schemes, sewerage schemes, and industrial projects. The films and models may be borrowed, usually without charge, from the members concerned. The list itself is obtainable from the Federation of Civil Engineering Contractors, Romney House, Tufton Street, Westminster, London, S.W.1.

SHELL MOULD AND COREMAKING

Polygram Six-Station Automatic Machine

LONG experience of the Polygram Casting Company, Limited, Frant (Sussex), is embodied in its new automatic shell mould and shell coremaking machine. Revolutionary in design, the machine is claimed to be several years in advance of other machines currently available anywhere in the world. The machine was demonstrated recently at the company's works at Tunbridge Wells (Kent).

A feature of the machine is that a large output of both moulds and cores can be achieved with the labour of only two men. For example, the machine will handle coreboxes up to 28 in. by 18 in. by 12 in. deep, and is capable of producing such cores at the approximate rate of 100/hr. Smaller cores can be produced from multi-impression coreboxes at an equivalent rate, so that with six impression boxes, the rate of core production will be approximately 600 cores/hr. Production of shell moulds is likewise extremely high—200/hr.

The machine (Fig. 1) consists of six manipulator stations, mounted radially, at 60-deg. intervals, on a 12-ft. dia. turntable. The turntable is power driven by a unique indexing device, features of which are its simple and extremely rigid construction, and the fact that at all times the table is rigidly interlocked with the power mechanism both during its arcuate motion and during its dwell periods. Power services, compressed air and electrical, are fed to the table through the centre bearing, and thence individually to each of the six manipulators.

In operation, each manipulator is indexed successively beneath the blowing head. The head is pneumatically clamped over the core box or pattern plate assembly and immediately fills the cavity under any desired blowing pressure. After a predetermined time the head retracts. The manipulator then inverts through 180 deg. to expel the excess coated sand, and can be made to rock to ensure complete extraction. The table, meanwhile, can be indexed to the next station, and then successively through stations three, four, and five. As the sixth station is approached, the pressure plates of the manipulator automatically separate, actuating the ejection. An operator is stationed at this ejection point to remove the ejected shell and cores and then to depress the valve to index the table to the next station. The excess sand is reclaimed. It is collected by a chute elevated to a vibrating screen, which removes pieces of partially invested material before passing to a storage hopper.

The whole unit is capable of a high production of both moulds and cores and it is interesting that both cores and moulds for the same component can be made at the same time. Apart from the operations of closing the moulds and pouring them, all other processes in the production of a casting are carried out with the machine. The fact that the moulds are produced by blowing the coated sand over a pattern plate should improve the density of packing of the moulds.

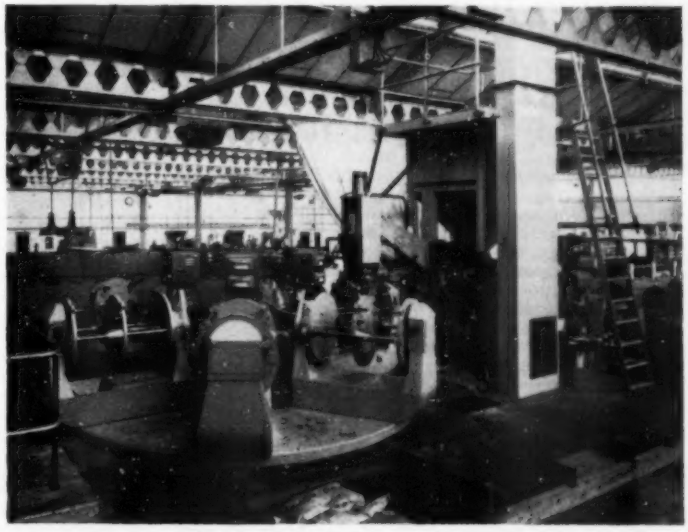


FIG. 1.—VIEW OF POLYGRAM SIX-STATION AUTOMATIC SHELL MOULD AND COREMAKING MACHINE. EACH MANIPULATOR UNIT MOVES IN TURN UNDER THE BLOWING HEAD. IN THIS PHOTOGRAPH THE UNITS ARE WITHOUT COREBOXES EXCEPT FOR THE ONE UNDER THE HEAD.

New Literature

READERS wishing to obtain a copy of any of the house magazines, catalogues, pamphlets, and other publications referred to below should write direct to the address given, at the same time mentioning this journal.

HEAD WRIGHTSON MACHINE COMPANY, LIMITED, Middlesbrough—The company's range of plate levelling machines is outlined briefly in a new pamphlet.

BRITISH STEEL FOUNDERS' ASSOCIATION, 13, Broomgrove Road, Sheffield 10—"Keep up to date with steelfoundry techniques" is the advice given in an attractive leaflet being circulated by the association.

J. H. FENNER & COMPANY, LIMITED, Marfleet Avenue, Hull—Some of the more recent installations of the company's equipment are described in the September issue of the V-Belt Journal. The articles are brightly written and presented and well illustrated.

FOSECO, LIMITED, Drayton Manor, Tamworth (Staffs)—Short articles on "Shrinkage Defect in Aluminium Alloy Gravity Diecasting," "A Simple Mould Clamp," "Cupola Efficiency Improved with Brix 100," and "Coresand Grain Size" are contained in the August issue of Foseco Foundry Practice.

NATIONAL UNION OF MANUFACTURERS, 6, Holborn Viaduct, London, E.C.1—September issue of the British Manufacturer (2s.) carries the first of a series of articles on design in industry, the author of which is Dan Johnston, industrial officer of the Council of Industrial Design. H. J. Gray, director of the National Union, writes on "Economic Planning."

INTERNATIONAL COMBUSTION PRODUCTS, LIMITED, 19, Woburn Place, London, W.C.1—"Ty-Rock Full Floating Screens," a new brochure (G615), describes the two heavier Ty-rock screens which are extensively used for heavy-duty services and for large-scale production plants. The new publication is supplementary to an earlier brochure (G557), which covered the medium range of Ty-rock screens.

TEES-SIDE AND SOUTH WEST DURHAM CHAMBER OF COMMERCE, North Eastern Bank Chambers, Marton Road, Middlesbrough—A round-up of industrial activities in the area is presented month by month in the Tees-side Journal of Commerce, the September issue of which features news of Dorman Long (Steel), Limited, Westool, Limited, Head Wrightson Machine Company, Limited, and many other companies.

ALUMINIUM DEVELOPMENT ASSOCIATION, 33, Grosvenor Street, London, W.1—Efforts made in recent years by motor-car manufacturers and those who make consumer goods to increase the appeal and sales value of their wares by using aluminium bright trim are outlined in an article in the September number of the Aluminium Courier (2s. 6d.). Special fasteners for aluminium are described in the "Aluminium in Practice" series.

TIN PUBLICATIONS, LIMITED, 8, Spring Gardens, Trafalgar Square, London, W.C.2—The September number of Tin, "the international monthly magazine for the producers and consumers of tin," available on annual subscription, includes an article on "Improving Tinplate—by Smoothing the Steel," in which it is pointed out that ironing out the micropeaks on the steel base of tinplate and speeding up the heat treatment of the steel strip are the latest developments in the continuous improvement of electrolytic tinplate. Other features include a four-page statistical supplement.

SIMON ENGINEERING DUDLEY, LIMITED, Queen's Cross, Dudley (Worcs)—Members of the Association of Public Lighting Engineers are meeting at Scarborough next month to discuss collectively the best ways "to promote, encourage, and improve the science of efficient public lighting." To the attendant problems of maintaining in good working order the lighting of this country's highways and byways, Simon Engineering lends a helping arm—the long double-jointed acrobatic arm of the Simon hydraulic platform. The latest types will be displayed in the outdoor exhibition at Scarborough. Details are contained in the September issue of SHM News.

GEORGE COHEN 600 GROUP, LIMITED, 600, Wood Lane, London, W.12—Few, if any, of the publications emanating from industry can be more widely known than the "600" Magazine. And certainly none can be more avidly read. Four times a year the "600" arrives to interest, inform, and entertain. The 76 pages of the autumn number are packed with the usual happy selection of articles, photographs, cartoons, and "oddments." While some of the features are naturally designed to keep readers up to date with the activities of the many companies in the group, others are much more general in character, making the "600" a real family magazine.

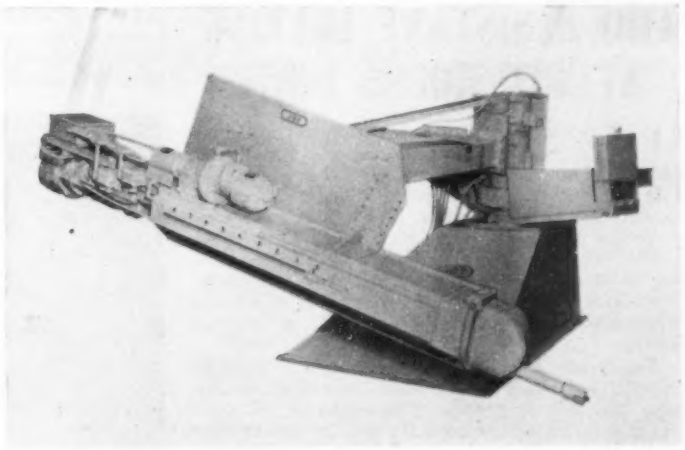
INTERNATIONAL NICKEL COMPANY (MOND), LIMITED, Thames House, Millbank, London, S.W.1—Articles on the ubiquitous applications of nickel-containing materials as well as an article on rhodium-plated silverware are contained in the latest (No. 18) issue of the Inco-Mond Magazine. The vital part nickel plays in the construction and easy running of the s.s. Canberra, latest addition to the P. & O.-Orient Line's fleet of luxury liners, is described in another feature. The major uses are in the propellers, davits, condensers, boilers, stabilizers, cutlery, and compasses. Further articles in the magazine include "The Stainless-steel Plant Used in Making 'Acrilan' Synthetic Fibre" and "The Constructional Nickel-steels in the Gearbox and Steering Mechanisms of the 'E' type Jaguar."

ANGLO AMERICAN CORPORATION OF SOUTH AFRICA, LIMITED (Public Relations Department), 44, Main Street, Johannesburg—"Mining and metallurgy in Southern Africa call not only for the use of the best techniques developed in other countries, but also for many major innovations to suit the particular conditions in which mining takes place," states "Modern Mining Practice," a feature in the September number of Optima (2s. 6d.) compiled by the corporation's consulting engineers. The article goes on to describe the methods used in the production of copper, lead, and zinc, the provision for the well-being of African workers in coal mining, and the vigorous policy of medical care for all Africans in the mining industry. There are many other excellent articles in the issue, among them "Safety in Mining" and "New Films on Mining in Southern Africa."

Improved Excavator Action

Introduction of a new auto-positive dual crowd system on the Smith "21" excavators, is announced by Thomas Smith & Sons (Rodley), Limited. This modification is a further step in the process of improving excavator action. The earliest, or luffing-shovel type of arm, moved the bucket in a simple arc. The introduction of automatic rope crowd mechanism made the bucket also push hard into the face of the material and thus dig more deeply. The positive chain crowd system added to this a definite reversing mechanism and now the new method provides an immensely easier form of control, not only ensuring deep "bite" in the right position but also ensuring accuracy in the positioning of the bucket load for discharge.

Joy BFD Blast-furnace Drill



THE JOY BFD BLAST-FURNACE DRILL DEVELOPED BY THE JOY MANUFACTURING COMPANY, PITTSBURGH, US.

STUDIES made in the United States and consultation with blast-furnace superintendents have indicated that an all-electric drill of rotary type offers a number of advantages for tapping blast furnaces. As a result of this research the Joy BFD blast-furnace drill has been developed by the Joy Manufacturing Company, Pittsburgh, and models have already been supplied to the United States Steel Corporation and to the Jones & Laughlin Steel Corporation. A drill is now in service in France.

Remotely controlled and push-button operated, the Joy BFD requires only one man to drill the iron notch, including penetration of the skull. The operator can be stationed safely in the pulpit area in which the clay gun controls are situated. A steady sweeping motion, without vibration, automatically positions the drill for an accurate tap hole and the powerful rotary action easily penetrates carbonaceous materials. Drill rotation is 300 r.p.m. and forward drilling speed is 4 ft./min. Clogging, stalling, and lunging through weak areas is avoided and the drill rapidly penetrates the skull. Oxygen lancing is unnecessary and the clay and skull are not damaged or vibrated during drilling. The operator has over-riding control at all times, though normally drilling operations are automatic, using limit switches to initiate each phase of the operation.

The drill retracts at 100 to 150 ft./min., preventing damage to rod or bit and automatically swings away from the drilling position. Air at 80 lb./sq. in., directed through the hollow drill rod, cleans cuttings from the hole, cools the drill bit, and also holds back metal flow. Sparks blown back from the tap hole signal the operator when to retract.

Individual electric motors operate drill swing, drill rotation, forward motion, and retraction. The clean design makes the BFD easy to service and maintain. Each motor is easily accessible and is fitted with external grease leads for quick maintenance. Feed lengths are from 6 to 12 ft. Bits can be made by the furnace maintenance department and resharpened for repeated use.

Electrical supply between 220V and 240V, 3-phase, 25 to 60 cycles, is catered for as standard. The complete drill, with base, weighs approximately 15 cwt. It is supplied in this country by Joy-Sullivan, Limited, 7, Harley Street, London, W.1.

Beryllia-free Mallory 73 Beryllium Copper

ALL Mallory 73 beryllium copper strip up to 0.025 in. thick is now being supplied with beryllia-free surfaces by Johnson Matthey & Company, Limited. This will reduce tool wear without affecting the mechanical properties of the alloy. Undue tool wear is attributable to the presence of beryllia, a hard and abrasive oxide of beryllium that is formed during the solution heat treatment of the alloy. The oxide is colourless and is not removed by normal cleaning or pickling methods, so that it is often present on material that appears to have a good surface finish.

A new process developed by the company completely removes beryllia, and the improved material is supplied at no extra cost. Details of Mallory 73 beryllium copper are given in a data sheet obtainable from the company at 73-83, Hatton Garden, London, E.C.1.

EXPORTS OF IRON ORE from Venezuela fell from 5,300,000 tons in the first quarter of 1960 to 4,390,000 tons in the first three months of 1961. The reduction was attributed to the sharp fall in production of the US steel industry in January and February.

FIRE-RESISTANT BELTING AT PIT HOUSE DRIFT

OVER 4,500 ft. of fire-resistant conveyor belting has been supplied to the National Coal Board by BTR Industries, Limited, for Pit House Drift, one of the NCB's largest and most important developments. This latest BTR development in conveyor belting is a patented construction consisting of a continuous filament nylon stress member with a cotton cover warp and a continuous filament nylon weft (Fig. 1) and represents a major departure from conventional methods of weaving fabric.

The drive unit at Pit House Drift is a Meco 300-h.p. unit with an electrically controlled scoop-type hydraulic coupling. The length of the conveyor is 2,199 ft. 4 in. between centres, the gradient of the drift varies from almost flat to 1 in 4.36, and

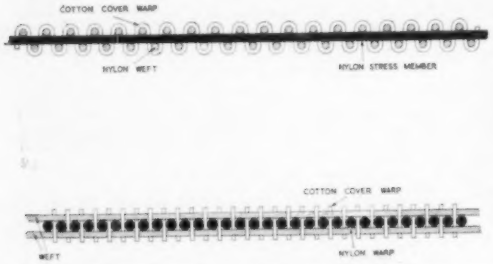


FIG. 1.—CONSTRUCTION OF BTR CONVEYOR BELT WITH CONTINUOUS FILAMENT NYLON STRESS MEMBER. THE UPPER SECTION SHOWS THE CONSTRUCTION THROUGH THE WEFT AND THE LOWER SECTION THROUGH THE WARP.

the total lift is 478 ft. Without shock or surge the belt can be accelerated to 421 ft./min. in 10 sec. and can be stopped smoothly under maximum load in 5 sec. The belting supplied is of three-ply construction only, but has a breaking stress of over 6,000 lb./in., is designed to operate at a maximum tension of over 600 lb./in., and was manufactured by BTR in four lengths, each of approximately 1,200 ft. and each weighing 5 tons. The joints were vulcanized by BTR technicians.

Installation took place during June, 1960, and the belt has been on trial, operating at full capacity since August 20, handling approximately 12,000 tons weekly. The surface section of the drift is shown in Fig. 2.

This belting is available in two to eight plies, dependent on the width of the belt. For belts of three-ply and over, the joints should be spliced and can be operated at 200 lb./in./ply. The maximum working stress for the two-ply belt, either with fasteners or spliced, is 240-lb./in. A three-ply belt with fasteners can be operated at 440 lb./in. Apart from high-tensile characteristics it is claimed that impact resistance and tear resistance are higher than conventional belts, and a high degree of flexibility, greater resistance to shock loads, and improved adhesion are obtained. Also it can be folded over itself without being subject to lateral cracks or longitudinal splits; if the

FIG. 2.—SURFACE SECTION OF THE PIT HOUSE DRIFT (CO. DURHAM), FITTED WITH NYLON REINFORCED THREE-PLY CONVEYOR BELTING.

carcase is damaged locally the rip will not spread; pulley diameters can be smaller than normal for belts which are so highly stressed. The combination of these advantages makes this new fire-resistant belting ideally suited for installations where high tonnages and large, sharp-edged materials are hand'ed over long distances.

New Zealand Coal

COAL production in New Zealand in 1960 exceeded 3,000,000 tons for the first time. Increased demand came from the Meremere power station, which raised its consumption by 305,000 tons over 1959 to 615,000 tons, representing nearly 40 per cent. of the total North Island demand.

Sales of coal for domestic purposes have remained fairly constant, but there have been reduced demands for railway purposes and from industry generally.

EXPERIMENTAL H-IRON PROGRAMME has been successfully completed by the Bethlehem Steel Company, and no further operations are scheduled for the present at the pilot plant, according to Iron Age. Reducing iron by hydrogen, the plant has a rated capacity of 110 tons of iron a day.

Hydraulic Direction Reverser

for Industrial Tractors

PRINCIPAL of the "Reversamatic" direction reverser fitted to all new John-Deere Lanz tractors being distributed in England and Wales by J. D. Tractors, Limited, Windsor (Berks), can be described as a mechanical drive which is hydraulically operated. This mechanical drive consists of a reverse gear train which is brought in and out of operation by two metallic clutches.

Both clutches operate in oil, a system which over the last few years has proved to give much longer life and fewer adjustments between overhauls.

The clutches are operated by hydraulic pressure (using the same oil), with a pre-set automatic time delay. The change in direction is completely smooth, yet to the onlooker appears almost instantaneous. Fig. 1 shows the method of operation of the direction reverser.

A lobe type pump (A), mounted on and driven by the direction reverser input shaft, draws oil from the reverser sump. The main oil supply is pumped to the 100-lb./sq. in. relief valve (B) through the adjustable restrictor (C) and the hydraulic accumulator (D) to the clutch valve (E) which is operated by the clutch pedal. When the pedal is released oil

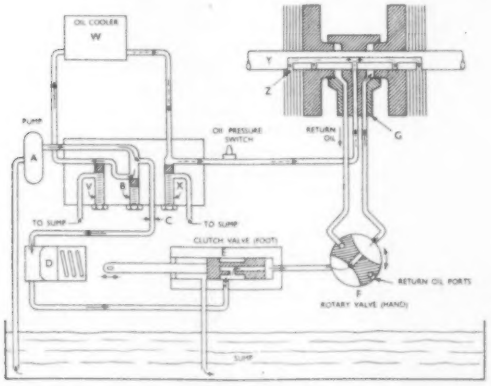


FIG. 1.—OPERATION OF THE JOHN DEERE-LANZ "REVERSAMATIC" DIRECTION REVERSER.

flows through the clutch valve spool to the rotary valve (F) which is operated by the hand control. From this point oil is supplied to either the forward or reverse piston of the hydraulic oil distributor (G) (dependent on the position of the rotary valve) and acts to compress the appropriate clutch plates, thus providing a drive.

A secondary oil circuit is provided basically to separate the clutch plates when the drive is reversed, or disconnected by depressing the clutch pedal. The secondary flow also ensures lubrication of the moving parts, and a flow through the oil cooler to maintain the oil temperature at an appropriate level.

This secondary flow of oil at 20 lb./sq. in. arises when the volume of main pressure oil flowing is reduced to such an extent by the restrictor that the pressure build-up overcomes the 100-lb./sq. in relief valve, by-passes through the dump passage and flows through a 90-lb./sq. in. relief valve (V) to the oil cooler (W). After passing through the cooler the oil flows to the centre passage of the oil distribution via a 20-lb./sq. in. relief valve (X), thence it flows through a port into the hollow centre of the

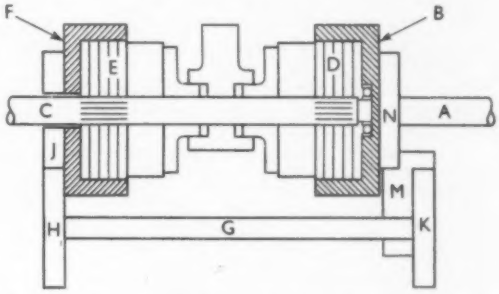


FIG. 2.—MECHANICAL ARRANGEMENT OF THE DIRECTION REVERSER.

direction reverser output shaft (Y). It lubricates the pistons through ports and also flows out between the clutch plates (Z), separating them when the main pressure is removed. It also acts as a cushion on engagement.

The function of the restrictor and the accumulator is to provide a time delay in building up a sufficient pressure and volume of oil to actuate the clutch engaging pistons.

This prevents immediate engagement of the drive when direction is changed and, of course, protects the whole transmission from excessive shock loading.

The mechanical construction of the direction reverser (Fig. 2) includes an input shaft (A) with integral gear and front spider (B). Spigoted into this input shaft is the output shaft (C) which has forward and reverse clutch plates splined on to it

(D and E), together with the reverse spider (F) and gear assembly, which is free to rotate. Underneath is a countershaft (G) with a gear at either end; one of these (H) meshes with the reverse spider gear (J) and the other gear meshes (K) with an idler (M) which engages the input shaft gear (N).

This arrangement provides a drive to the countershaft.

When the forward clutch is engaged the output shaft is driven directly. The countershaft drive operates, but since the reverse clutches are not engaged, the reverse spider merely spins on the output shaft.

When the reverse clutch is engaged the drive is transmitted through the countershaft and this results in reverse rotation of the output shaft. No direct drive is transmitted because the forward clutch is free. When the foot pedal is depressed both forward and reverse clutches are free and no drive is transmitted.

Book Review

The Miners of South Wales. By E. W. Evans. The University of Wales Press, University Registry, Cathays Park, Cardiff. Price 21s.

THIS work is based on a thesis prepared at the University College of Wales, Aberystwyth, under the supervision of Prof. Arthur Beacham, and the author expresses his sincere gratitude for his guidance and advice, recalling also the valuable criticisms and comments of Prof. David Williams. Mention is also made of his indebtedness to the National Library of Wales and other sources, including the archives of the National Union of Mineworkers at Cardiff.

The author's field of investigation in various ways covers the last century and the earlier years of the present. There are numerous appendices and copious notes filling some 45 pages. As a thesis the work is commendable and it may be of assistance to others delving into the past. Otherwise its value is purely academic.

NATIONAL COAL BOARD SPECIFICATIONS

SPECIFICATIONS recently issued by the National Coal Board include those mentioned below. Specifications may be obtained from the board at Hobart House, Grosvenor Place, London, S.W.1, the charge for each one being 6d. unless otherwise stated.

No. 241/1961 (revised) applies to ordinary incandescent lamps for general lighting purposes and to tungsten filament electric lamps.

No. 245/1961 (1s.) covers the fire-resistant properties of unsupported plastic sheeting and suitably treated or impregnated textile fabric for use in the National Coal Board.

No. 252/1961 (9d.) relates to single-ended hacksaw blades for hand and power operation, manufactured from tungsten steel. The following types are covered:—Low-tungsten steel, all hard type for hand use; low-tungsten steel, flexible type for hand use; high-speed steel, all hard type for hand operation; high-speed steel, all hard type for power use.

No. 253/1961 covers hooks for shunting poles.

No. 254/1961 applies to brake sticks.

No. 258/1961 applies to steel straightedges up to and including 6 ft. in length, of rectangular section, with both working faces finished straight and parallel, such as may be used on surface tables and for testing the alignment of machine tools.

No. 259/1961 applies to engineers' ratchet braces and drilling pillars complying in every respect with BS 1937.

No. 260/1961 covers factory made fabric for concrete reinforcement consisting of (*a*) main steel wires with cross wires electrically welded to them; (*b*) fabric made from cold twisted steel bars; (*c*) expanded metal fabric of 3-in. mesh and over.

No. 261/1961 lays down requirements for covered electrodes of 12 s.w.g. ($\frac{3}{32}$ in.) and thicker sizes for the metal-arc welding (by hand operation) of mild-steel welding quality. This is defined as carbon steel having an ultimate strength of not more than 33 ton/sq. in. and sulphur and phosphorus contents not greater than 0.06 per cent. each.

No. 262/1961 applies to engineers' steel squares, commonly known as try-squares, in which the blade is fixed relative to the stock. It does not apply to adjustable squares of the type in which the blade is movable through the stock.

No. 267/1961 refers to feeler gauges, comprising a series of gauging blades of graduated thickness in 1-in. units, assembled in a protective sheath. Provision is made for blades of thickness from 0.0015 to 0.025 in. inclusive.

No. 269/1961 relates to open-ended spanners having jaw openings suitable for hexagon sizes in the following standards or ranges in both single-ended and double-ended forms:—Unified precision hexagon bolts, screws, nuts (UNC and UNF threads) and plain washers, normal series (BS 1786); unified black hexagon bolts, screws, nuts (UNC and UNF threads) and plain washers, heavy series (BS 1769); unified machine screws and machine screw nuts (BS 1981); precision hexagon bolts, screws, nuts (BSW and BSF threads) and plain washers (BS 1083); black bolts and nuts, hexagon and square, BSW and BSF threads (BS 916); Whitworth large hexagons (originally specified in BS 190, now obsolete); metric hexagons.

THE BANK OF LONDON & SOUTH AMERICA reports that Forjas Nacionais S.A. (Fornasa) has received an offer from Ferrostaal, of western Germany, of a credit of US $312,329 to cover the supply of equipment to be used in expanding the Brazilian firm's plant, which produces steel for the motor-vehicle industry.

ISI Special Meeting in the USA and Canada

National Forge Company

Among the works to be visited by British metallurgists and steelworks engineers during the forthcoming special meeting of the Iron and Steel Institute in the United States and Canada is that of the National Forge Company, an integrated producer of forged products which include crankshafts, ship shafts, rolls for centrifugal casting, and high-pressure equipment.

THE National Forge Company was started at Erie by Clinton E. Wilder in 1914. In 1916 the company moved to its present home at Irvine, in Warren County, Pennsylvania. Some 20 men were employed in making spindles, eccentrics, and small single-throw crankshafts. The plant consisted of a 4,000-lb. steam hammer, a small open-side hammer, two small lathes, two slotters, two drill presses, and a power hacksaw.

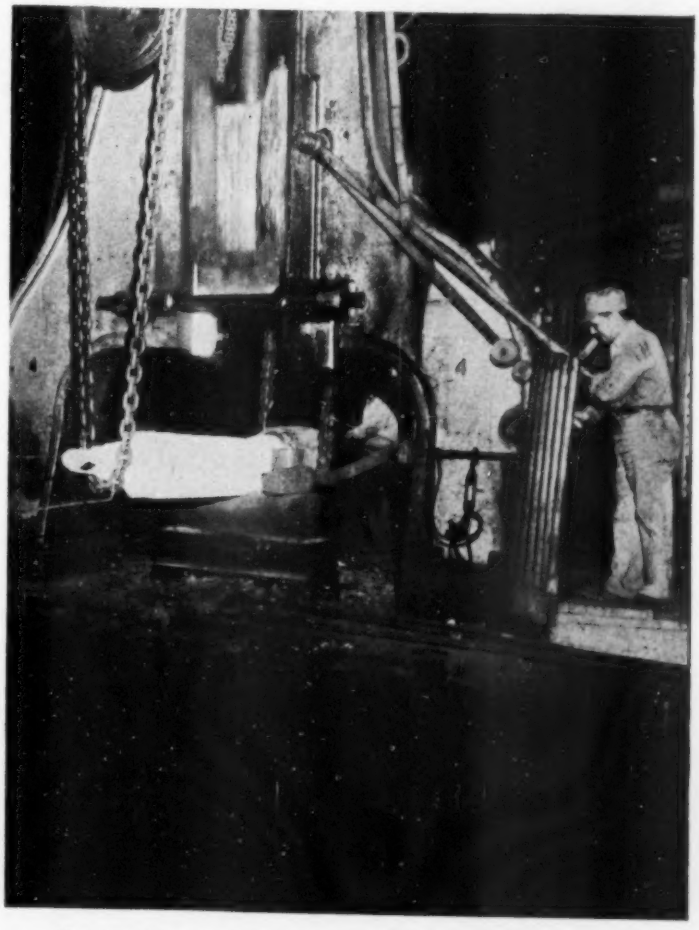
Today the company finds work for nearly 1,000 employees in a factory with over 400,000 sq. ft. of floor space with facilities for steelmaking and fabrication of a large variety of products.

Steelmaking

The company's steel requirements are met by its own furnaces, operating on high-grade low-phosphorus scrap. There are three basic, electric-arc furnaces of 5, 11, and 20 tons capacity. A fourth furnace, of 35 tons, is planned. Carbon alloy, nitriding, and stainless steels are made.

The Dortmund-Hörder system for the vacuum processing of molten steel is used. The system provides effective removal of gases, while simultaneously allowing precise quantities of alloying elements to be added under vacuum, with very little loss. Both killed and non-killed steels can be processed, deoxidizing agents being added in the vacuum vessel just prior to teeming.

The unit installed has a capacity of from 10 to 60 tons, allowing the company to vacuum process a variety of heat sizes. The total contents of the ladle of steel are thoroughly mixed during vacuum process-



HAMMER FORGING A SHAFT FOR ROCKET LAUNCHING APPLICATION.

VACUUM PROCESSING UNIT OF THE DORTMUND-HÖRDER TYPE.

ing before being circulated at least three times through the vacuum vessel.

Forging

Large items are press forged in a 3,000-ton steam hydraulic press, or on a 1,250-ton press. Smaller pieces are usually forged in the hammer shop, which has hammers of 8,000-, 2,500-, and 1,500-lb. capacities. A unique multi-directional press is used for special applications. This has two 4,000-ton upsetting strokes and a 1,100-ton offset stroke. A variety of forging operations, including extruding and piercing, can be performed. Forging of diesel locomotive crankshafts is an outstanding application of the press, since the shafts can be forged with full continuity of grain flow and distortion-free characteristics.

Rough Machining

Rough machining prior to heat treatment is done on heavy-duty equipment. Cylindrical forgings up to 52 in. dia. and 60 ft. long are turned: planers can handle forgings 60 in. by 60 in. in any section, and over 32 in. long. Prior to the machining, macro discs are sawed and checked. Often rough-machined forgings are ground to provide a suitable surface for ultrasonic or magnaflux inspection, as a further in-process quality check.

Precision Boring

The company has specialized in precision deep-hole boring for over 30 years, and now produces a diversified line of hollow-bored components. Bore diameter tolerances of ± 0.005 in. are standard in pieces up to 60 ft. long, and much closer tolerances are common, depending on the length of the forging and diameter of the bore. The diameter tolerance of honed bores may be held to ± 0.001 in.

Concentricity of the bore centreline to outside centreline is constantly maintained to 0.003 in. on lengths up to 20 ft.

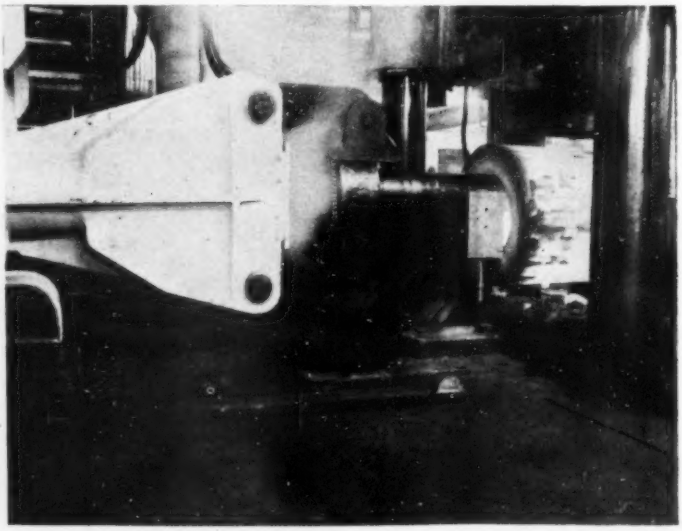
Heat Treating and Finishing

Heat-treating processes at National Forge include thermal stress relieving, annealing, normalizing, spheroidizing, and quenching and tempering. Normalizing, annealing, and spheroidizing are usually done in horizontal furnaces which can handle a piece 41 ft. long and 60,000 lb. in mass. The largest vertical furnace can accommodate items 50 ft. long.

There is an unusually large and complete finish machining department at National Forge, equipped with lathes, drills, planers, grinders, boring mills, and hones.

Nitriding

The company has nitriding facilities able to treat pieces 16 ft. long, weighing up to 16,000 lb. Using dissociated ammonia gas, the nitriding process can produce hardnesses to 90 Scleroscope, with normal case depths of 0.020 in. Irregularly shaped pieces or portions are easily nitrided, and sections to be left unhardened can be blocked off. Sections of full-sized diesel crankshafts tested after



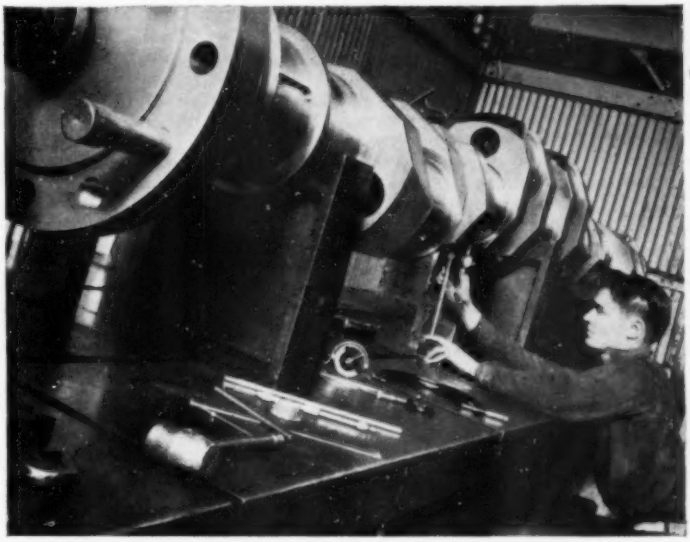
MANDREL FORGING ON A 3,000-TON PRESS.

nitriding have been shown to have had fatigue strength increased by more than 30 per cent.

Control of Quality

A vigorous quality control procedure is practised.

Each item has its own scheduled series of tests which it must pass. All tests and inspection data are analysed and recorded, and are available to the customer. The tests and inspection facilities include the following:—Ultrasonic, Magnaflux, Jominy hardenability, Tukon micro hardness, Rockwell (regular), Rockwell (superficial), Brinell hardness, Shore hardness, tensile, bend, impact, sub-zero impact, microscopic and macroscopic examinations, chemical analysis, steel gas analysis, heat indication, bore searching and gauging, profilometer, stainless intergranular corrosion, hydrostatic.



CHECKING A SIX-THROW DIESEL CRANKSHAFT FOR PARALLELISM.

Spring Manufacturers' Research Association

ADMITTANCE of the Coil Spring Federation Research Organization to full membership of the Government's industrial research association scheme under the title of "The Spring Manufacturers' Research Association" marks a big step forward in the growth and importance of this research organization. Founded in 1945, it first received grant aid from the Department of Scientific and Industrial Research in 1947, when it was still a comparatively small body struggling for acceptance by an industry where craft was the tradition rather than technology.

Since then, however, under the presidency of Mr. R. Salter Bache and the research direction of Mr. R. Haynes, it has grown in size and in industrial importance. Its present membership, including springmakers, users, and suppliers of springmaking materials, is 117.

Its first technical meeting as a research association—and the first ever to be held in the London area—was on Tuesday. This was one of the series of meetings arranged under the industrial liaison scheme. Members were encouraged to take part in a general discussion on technical problems rather than the more formal method of seeking answers only from the official speakers. Subjects at the London meeting included "The Manufacture of Spring Steel Wire" and "Some Aspects of Nickel Alloy Spring Materials."

Data on Theoretical Metallurgy

ENTROPY values and basic low-temperature heat-capacity data for nearly 1,300 substances are listed by the Bureau of Mines, US Department of the Interior, in its latest revision of a publication, "Entropies of the Elements and Inorganic Compounds" (Bulletin 592). The bulletin is the 14th in the bureau's series "Contributions to the Data on Theoretical Metallurgy." It provides information on 500 more compounds than were covered in the similarly titled Bulletin 477 published in 1950, which it supersedes.

Greatest value of entropy data, according to the bulletin, is their use in deriving "free energies of reaction." Knowledge of this "free energy of reaction" permits a scientist to "determine in advance if a given reaction is possible and, if it is, to what extent it will proceed under the conditions that may be imposed."

This is the fourth listing of low-temperature entropy values issued by the bureau as the result of research carried on at its Berkeley, California, thermodynamics laboratory.

The number of compounds has increased steadily with each publication, beginning with the initial 150 covered in 1932. "Low-temperature" as used in the publication refers to 77 deg. F. (25 deg. C. or 298.16 deg. Kelvin).

Basic determinations by other scientists all over the world have been converted to determinations at 77 deg.

Bulletin 592 can be obtained from the Superintendent of Documents, Government Printing Office (price 75 cents).

Accurate Coal Sampling

Development in Quality Control in the United States

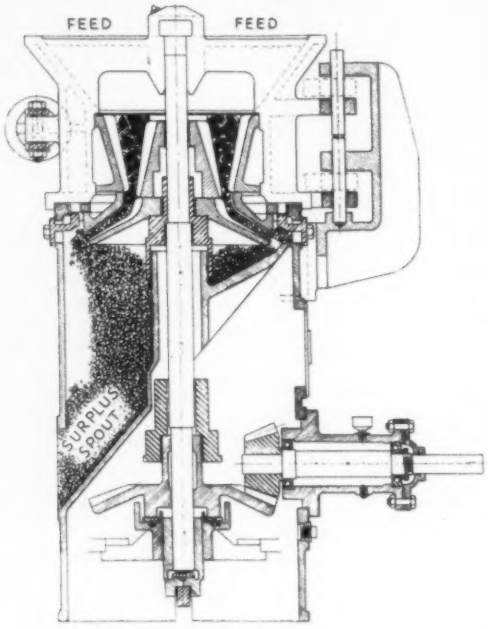


FIG. 1.—DIAGRAMMATIC ARRANGEMENT OF THE STURTEVANT CRUSHER SAMPLER.

Changes in the competitive climate of the coal-mining industry in Britain have led to great improvements in marketing and an increased awareness of the need for quality control of the product. Although the efficiency of coal-preparation plants has been greatly increased, the problems of obtaining on-the-spot samples remain. This article describes a method of sampling, using a portable crusher, developed by the Ringgold Coal Mining Company, Kitanning, Pa, for testing the quality of coal at the mine and at coal-stocking points.

IN the US over 65 per cent. of the large users of coal rigidly sample all coal received to ensure that the mineral is purchased on a strict B.t.u. basis, and to avoid paying full price for material that does not come up to a predetermined specification. US authorities regard sampling as one of the most important features determining successful and satisfactory application of the specification method of purchasing coal. Its purpose is (1) to further means whereby the Government is assured of receiving the coal quality for which it has contracted; (2) to protect the interest of the Government by providing a means for determining liquidated damages if contractors fail to deliver coal of the quality guaranteed; (3) to provide the purchasing officer with an official basis for making his purchases on a sound, uniform plan.

Of the coal users who check their coal, some have found that they could use cheaper coal. Others have found from obtaining accurate samples that penalties should be exacted, and receive them without contention from the contractor. Accurate samples of every car or barge of coal permits comparison of different coals, enabling the user to know exactly how many heat units will be developed, and the user and contractor can then agree on the exact value of the coal; thus costs become proportionate to value received. Coal sampling and analysis, these firms have found, is a positive, desirable check against specifications.

Limitations of Hand Sampling

According to the US Bureau of Mines Bulletin 116, the hand sampling of coal entails 34 different operations, and takes one man a full shift to produce anything like an average sample. The bureau's bulletin says: "One of the serious drawbacks to the general adoption of the specification method for the purchase of coal is the difficulty of obtaining, at reasonable cost, samples of coal that can be considered representative of the bulk product delivered. Therefore, the method of taking and preparing samples for the laboratory has been given as much care as the making of the analysis and tests." Under hand-sampling methods, excessive time expended in obtaining a

sample permits moisture evaporation from the sample, and the final analyses fail to show accurately the penalty that should be exacted for excess moisture.

In addition, the average man employed to obtain a sample will tend to throw out slate, rock, and other hard-to-crush material—for this involves hard work—and the final sample is thus not representative of the bulk delivery. Mechanical crushing and sampling eliminates these problems, for it is quick and thus prevents moisture loss; while non-coal material can be crushed without difficulty.

The machine that has been adopted in the US for the mechanical sampling of coal is the Sturtevant crusher sampler, developed and made by the Sturtevant Mill Company, of Boston, Mass. When fed with up to 3-in. coal, it crushes 1 ton or more per hr., a large proportion of which is finer than 20 mesh, and none larger than six mesh. Simultaneously, a representative sample of the whole of the material being crushed is automatically chosen. The coal to be sampled is passed into a hopper (Fig. 1) where it contacts a coarse crushing nut, which accomplishes the preliminary reduction by pressing the coal against the top of the liners. The resulting coarsely crushed material then passes by gravity to a rotating, fine-toothed crushing disc and stationary liner. Due to the progressive reduction, accompanied by the crushing and rotating action, a high degree of intermixing is accomplished. This gives a homogeneous product, in a finely divided condition, and an accurately representative mixture of the mineral fed into the hopper. Any hard slate, rock, etc., which tends to be avoided in hand sampling because it is difficult to crush, appears as an accurate percentage in the crushed material.

Handling the Surplus

Depending on the amount of impurities expected in the coal, a sample of 5, 10, or 15 per cent. of the total fed to the machine may be taken, these proportions being achieved by the use of interchangeable ejection spouts. The spout collects the sample from the finely crushed and homogeneous product, and is not taken from the roughly crushed portion and then further reduced. In this way a sample accurately representing the total material fed to the machine is obtained. The machine is also equipped with a fixed discharge spout for handling the surplus which has not gone to the sampling spout; this surplus is, of course, good usable material. A handwheel adjustment is provided at the lower body of the crusher which may be adjusted for fine or coarse grinding by determining the distance between the grinding members.

The machine operates on approximately 3 h.p., normally supplied by a motor. The horizontal or pinion shaft rotates at approximately 400 r.p.m. in a clockwise direction, when standing at the end of the shaft. The vertical shaft and crushing nut rotate clockwise at about 160 r.p.m. and a special open-door feature allows quick access to all parts for inspection and any maintenance that may be required. In actual practice, maintenance is very low; the cone and sideplates are constructed to withstand long periods of heavy usage. An average power station using the Sturtevant crusher samplers and operating them 16 hr./day, replaces the cone and sideplates once in five years.

While the crusher sampler is normally a stationary unit and is driven by an electric motor, in some instances it is an advantage to have the machine in a portable or transportable form, because some organizations need to carry out sampling at various points in their operating area. One way of converting the machine to a portable unit is to mount it on a road truck and arrange a drive from the truck engine. This allows the crusher sampler to be taken to any point where there is access for a truck, but the unit in this case is dependent upon the truck for its power.

Greater versatility is obtained by providing the crusher sampler with its own petrol engine. With this arrangement, while the unit is still dependent upon the truck for its transport, it is independent of the truck as a power source, and it can, when necessary, be placed at any required point and left to operate there, while the truck becomes available for other work.

One of the American firms using the Sturtevant crusher sampler in a portable form is Ringgold Coal Mining Company, of Kitanning, Pa. This company serves primarily power companies in Pennslyvania, north-eastern United States, and Canada, about one third of the coal sold going to Canada. It purchases its coal from a number of open-cast and deep mines; doing no mining itself, but serving solely as a coal broker. While operat-

FIG. 2.—THE RINGGOLD ORGANIZATION MADE THE STURTEVANT CRUSHER SAMPLER TRANSPORTABLE BY REPLACING THE NORMAL ELECTRIC MOTOR WITH A PETROL ENGINE. THIS GREATLY INCREASES THE VERSATILITY OF THE UNIT.

FIG. 3.—LABORATORY SAMPLES ARE PACKED INTO CANS WHICH CAN BE SEALED TO MAINTAIN SAMPLE IN THE DESIRED CONDITION. THE SPLITTER UNIT WHICH PROVIDES A SAMPLE FROM THE LARGE SAMPLE OF THE CRUSHER SAMPLER IS SITED NEAR THE BASE OF THE LATTER.

ing as a broker may offer benefits different from those of a mining concern, it offers problems as well. Ringgold must attest to the quality of the coal it delivers. The company must ensure that its high-volatile, bituminous coal meets B.t.u. specifications, regardless of the mine from which it comes. It requires close control of quality over numerous shipments from a variety of independent operators and penalties if they are exacted, fall on the broker.

Since the formation of Ringgold Coal Mining Company in 1921, coal sampling has played an important role in quality control. Until 1959, all Ringgold coal was sampled at its laboratory. At present the company is still handling some of the coal sampling on an independent laboratory basis; other samples go to different laboratories. The volume of coal to be sampled created an economic problem; the tonnage of coal handled merely for sampling was high and the cost per sample, considering that the coal had to be crushed and tested by independent concerns, was excessive. Naturally, Ringgold wanted to reduce sample tonnage hauled, reduce cost per sample, increase the number of overall samples, and achieve a better quality control, with a more accurate analysis of the coal.

On-the-spot Sampling

In 1960, Ringgold consulted the Sturtevant company. Ringgold, however, did not want to install the crusher sampler at its Kitanning headquarters, nor in a laboratory like the one that had been doing the crushing and sampling for many years. The firm wanted instead to achieve on-the-spot sampling at the mine, along the road, and at point of delivery. This meant that the standard 3-h.p. crusher sampler driven by an electric motor would need to be modified to make it portable. It was finally ascertained that the crusher sampler could be independently powered by a petrol engine instead of the electric motor, and this would enable it to be located anywhere.

Now, with the truck-mounted crusher sampler (Fig. 2) which was installed late in 1960, Ringgold samples at mines and coal-stocking points. The company is studying the economic feasibility of sampling at the point of delivery for local customers and at the point of shipment for distant customers. This would give a moisture reading on the spot, a true ash content determination, and also a small, laboratory-size sample for analysis. Seventy five pounds of coal introduced into the crusher sampler produces an ultimate 3½-lb. sample.

The truck can sample at the company's five most distant suppliers and stocking points in a working day, allowing 90 min. between stops and the crushing of 0.5 ton of coal at each. This yields a 150-lb. initial sample which is fed to a splitter which further cuts it to about 7 lb. of fine homogeneous particles for laboratory analysis. The function of the splitter is to produce a sample from a sample. The truck does not always take just one sample and then move to another area; it may remain at a single mine for a day, taking channel samples, mined coal samples, or making other checks. At a stocking area the driver sampler might remain a whole day, checking deliveries, blends, and shipments. To keep samples chemically stable, Ringgold's man tightly seals them in screw-top metal cans (Fig. 3) to ensure no loss or gain in moisture content between sampling and testing and prevents any heterogeneous matter getting into the sample.

Coal-fired Gas Turbine Tests

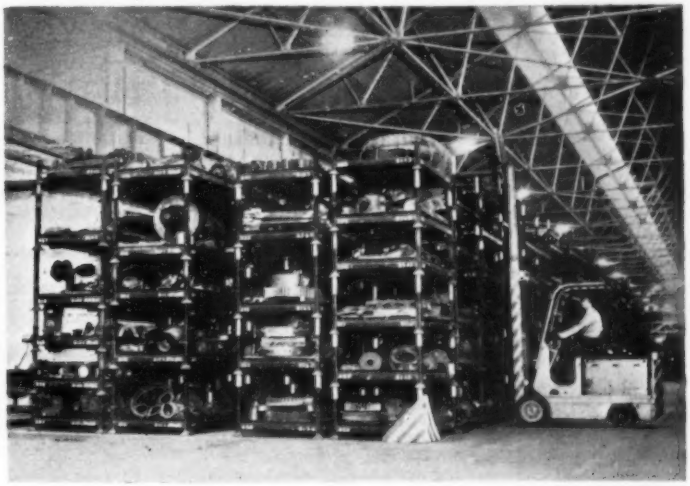
One of the major problems connected with the development of a coal-fired gas turbine is the control of ash to minimize wear on the blades. The United States Bureau of Mines has asked for tenders for the supply of electrostatic precipitators to be used in turbine tests.

Model of Durgapur Steelworks

Made to a scale of $\frac{1}{16}$ in. to a foot, a model showing the four main areas of the new Durgapur Steelworks in West Bengal has been produced for Davy & United Engineering Company, Limited (a member of the Davy-Ashmore group), in the model-making department at Stockton of the Power-Gas Corporation, Limited, another Davy-Ashmore subsidiary. Davy-Ashmore is presenting the model to Hindustan Steel, Limited, for the latter company to display on its stand at the forthcoming Indian Industries Fair in New Delhi. As members of Iscon, the British consortium which is building the whole of the Durgapur Steelworks, Davy & United Engineering Company, Limited, is responsible for four principal areas of the works.

SCOW

MEETS EXPANSION with STORES MODERNIZATION



VIEW OF THE FFRWDWLLT STORES AFTER PALLETIZATION.

ONE of the biggest stores modernization schemes ever tackled by the material handling division of Fisher & Ludlow, Limited, Tipton (Staffs), has resulted in a transformation of the vast storage system serving rolling mills and workshops of the Steel Company of Wales, Limited, at Margam and Port Talbot. By palletization, making use of vertical space, an increase of about 80 per cent. has been achieved in the capacity of existing stores buildings, which are now able to hold materials valued at more than £4,500,000, and it has been possible to dispense with a proposed new stores building which was estimated to cost £250,000.

Replanning of the methods of storing the vast quantity of spares, running into millions of items from small screws to heavy machines, was first considered in 1957. At that time about £2,500,000 worth of equipment was held in nearly 80,000 sq. ft. of floor space in the main bay of the stores at the Abbey Works, at the store known as Ffrwdwyllt, at the Margam Works, and in two locations borrowed from other departments. This accommodation was already proving inadequate under the pressure of increasing production, but, in addition, provision had to be made for a further big increase in spares arising out of the company's expansion plan.

Fisher & Ludlow's project engineers spent five weeks at Margam and Port Talbot, their task involving the measurement, weighing, and classification of more than 40,000 items of controlled spares and 5,000 items of consumable materials. Their conclusion was that the best solution was palletization, building upwards to use hitherto wasted air space, and they recommended special Fisholow post-type steel pallets, with a standard 6-ft. by 4-ft. frame, but with extension posts adjustable for height up to 6 ft. 2 in. according to the equipment carried. It was necessary for each pallet to take a load of up to 3 tons and to allow for stacking up to six high they had to be made to sustain a load of 18 tons. For spares which, because of weight or shape, could not be accommodated on pallets, such as mill rods, it was proposed to use racks and cradles.

The original Fisholow scheme involved the provision of 4,640 pallets and about 1,000 racks and cradles, about half of which were to go into the proposed new stores building at Ffrwdwllt, giving a 40 per cent. increase in storage capacity for a 17 per cent. increase in floor area. After further study, however, it was decided that the new building could be dispensed with and needs met by palletization in the existing space after finding new locations in a crane bay and at an old tinplate works at Swansea for very heavy and slow-moving stock.

The revised scheme makes maximum use of the main bay at the Abbey Works and the existing store at Ffrwdwyllt. In these premises palletization has already reached an advanced stage, with about 1,500 Fisholow pallets now in use at Abbey and about 1,000 at Ffrwdwyllt; 1,000 more pallets are being brought into use at the two places as the scheme progresses. It has also been decided to palletize the electrical store at the Abbey Works, and 675 specially designed Fisholow pallets are being supplied for the storage of electric motors of various sizes, previously stored in fixed tubular racks.

Both at Abbey and at Ffrwdwyllt the pallets are arranged four deep and up to five high in blocks on either side of a broad gangway, with narrow aisles between the second and third rows so that small items can be obtained by hand by storekeepers with ladders without moving the tiered pallets.

Appointments

Works Staff Changes at Samuel Fox

NEW staff appointments at Samuel Fox & Company, Limited, a subsidiary of the United Steel Companies, Limited, will take effect from Monday, as a result of the retirement of Mr. G. Thickett. The latter is succeeded as works manager (heavy departments) by Mr. E. HAMPSHIRE, and Mr. P. THOMPSON becomes assistant works manager (heavy departments) and will also act as manager of the billet mill.

New manager of the billet finishing department is Mr. V. G. TYAS, and Mr. T. A. ROGERS, assistant manager, billet bank, and Mr. R. H. BARROTT, assistant manager, east bank, will be responsible to him. Mr. C. GRAY becomes manager of the bar and rod mill. Mr. K. E. FAULKNER, assistant manager (rolling), Mr. J. SPENCE, assistant manager (heat treatment and warehouse), and Mr. D. R. STONE, assistant manager (planning and supplies), will be responsible to Mr. Gray.

Formerly general manager of Head Wrightson Stockton, Limited, Mr. R. B. W. BOLLAND has been appointed London manager of Head, Wrightson & Company, Limited.

Mr. IAN M. PAINTON has been appointed publicity manager of James Booth Aluminium, Limited, Birmingham, one of the pioneers of the British aluminium industry and the sole producers of Duralumin.

Mr. R. H. WORMLEY, formerly Yorkshire area manager, has now been appointed home sales manager of Associated British Machine Tool Makers, Limited, London, S.W.1. He has been succeeded at the Leeds office by Mr. W. G. Ormrod.

From the Templeborough Works of Steel, Peech & Tozer, branch of the United Steel Companies, Limited, where he was works manager, Mr. CYRIL HORACE HAYTER has joined the Universal Asbestos Manufacturing Company, Limited, Watford, as group works manager.

Turner & Newall, Limited, whose interests include asbestos, chemicals, insulation, rubber, etc., has appointed as public relations officer to the group Mr. W. P. HOWARD, publicity manager of Ferodo, Limited, one of the constituent companies of the Turner & Newall group. He is succeeded at Ferodo by Mr. P. R. W. JUPE.

Dr. W. J. BATES has joined R. & J. Beck, Limited, manufacturers of optical instruments and other specialist scientific equipment, as chief engineer. He leaves Bristol University to lead Beck's design team, and until completion of the company's new factory at Watford will be located at Lister Works, Dickenson Street, London, N.W.5.

Mr. R. PRITCHARD has been appointed colliery electrical engineer at Cannock Wood Colliery, in the Cannock Chase Area of the West Midlands Division of the NCB. Mr. Pritchard has held a similar post since 1950 at Walsall Wood Colliery, where he served his apprenticeship and has given all his subsequent service in the industry. He is a member of the Association of Mining Electrical and Mechanical Engineers.

Mr. DESMOND AMBROSE, who was until recently, manager of the process control division of Constructors John Brown, Limited, has been appointed manager of the southern division of Fischer & Porter Limited, manufacturers of flowmeters and process control instruments, of Workington (Cumberland). Mr. Ambrose will operate from the southern sales offices of Fischer & Porter at 205, Station Road, Harrow (Middx).

Engineering division organization changes at Newton Chambers & Company, Limited, Thorncliffe, near Sheffield, are as follows:—Mr. L. NOBLE (assistant production controller) to be deputy production controller; Mr. E. HITCHMAN to be assistant production controller (Redfyre and light castings foundry); Mr. A. W. PECKITT (stores manager) to be responsible for the despatch of products from light castings and Redfyre departments as well as from the machine and fitting shop.

Mr. HARRY KAY, deputy managing director, marine division, of Richardsons, Westgarth & Company, Limited, marine, turbine, electrical, and general engineers, of Wallsend-on-Tyne, is to take up an appointment shortly with Tube Investments, Limited, as assistant managing director, engineering division. He will join Mr. Robert Atkinson, at one time managing director of William Doxford & Sons (Engineers), Limited, in controlling a group of companies with works in Bournemouth, Bedford, and the Birmingham area.

"Satisfactory" Profit Says Efco Chairman

SPEAKING at the annual meeting of Efco, Limited, electric furnace manufacturers, of London, S.W.1, Mr. D. F. Campbell, the chairman, said that during the last 18 months the capital structure of Efco had been altered by the creation in December, 1960, of 800,000 ordinary shares of 10s. each and £417,334 was capitalized from reserves and distributed to shareholders as a bonus issue in the ratio of 1 for 1.

During the present financial year, an offer of 208,668 ordinary shares of 10s. each, in the proportion of 1 for 8 at 27s. 6d. per share, has been made to shareholders, who have subscribed for 98.5 per cent. of these shares. The authorized capital of the company is now £1,200,000. Profit last year, before tax, was £322,805 (£289,881), which the chairman described as "satisfactory."

During the past five years, £420,000 has been spent on new works and extensions, as a result of which the amount of engineering and furnace plant made in the works has increased and that subcontracted has decreased substantially.

AYRSHIRE METAL PRODUCTS EXPANSION SCHEME

PLANT extension scheme costing about £75,000 is being carried out by Ayrshire Metal Products, Limited, Irvine (Ayrshire), which is expected to be completed by the spring. The firm, formerly the Ardrossan Dockyard Company, Limited, is a subsidiary of the Lithgows, Limited, group, and its present factory occupies over 200,000 sq. ft. of floor space divided into a rolling department, press shop, and fabrication shop.

The company manufactures cold-formed sections for a variety of uses, metal partitioning—its main product—and roof decking sheets and component parts for aluminium huts. At present the firm is fulfilling contracts for huts from countries in Africa.

IRON AND STEEL TRADE

VARIATIONS in the trade recently have tended to cancel each other out. An improvement in sales of heavy sections has been counterbalanced by reduced orders for plate and, although the number of transactions for all types of steel is quite respectable, the tonnage involved is far below that regarded as normal only a few months ago. Trade is now definitely on a day-to-day basis as the larger consumers have ample stocks to draw on and the smaller consumers know that they can count on almost immediate attention in the execution of their orders. It may suit the consumer but it does not make for economical employment of plant and labour at the mills.

Pig-iron

Current output of pig-iron is now on a much reduced scale. It is, however, more than sufficient to satisfy the demand from the steelworks and will remain so while the steelworks are down to producing at about 78 per cent. of capacity.

The foundry grades of pig-iron are readily available, but there is a fairly good demand for the low phosphorus irons by the engineering and speciality foundries. A reasonable amount of hematite and some refined iron is being taken up.

Ferro-alloys

Business in ferro-tungsten has reverted to a quieter level and the beginning of the fourth quarter sees no change in price of any of the major alloys. Ferro-silicon continues to be quite active and interest in ferro-chrome is fairly well maintained.

There is a fair call on ferro-titanium, while ferro-niobium is of less interest. Ferro-molybdenum and ferro-vanadium are in fair request.

Semi-finished Steel

There is little, if any improvement in the demand for most of the products of the re-rollers. Reinforcing rods and bars continue in good demand, but there is only a moderate call for small bars, light sections, and strip from home consumers. Export business is becoming more difficult as the competition grows from makers abroad.

Outputs are generally well below capacity levels and in many instances difficulty is experienced in keeping the mills going at the present rate of production. The re-rollers maintain a good demand for suitable defectives and crops from the steelworks.

Finished Steel

The position in regard to the motor industry and ancillary trades is still depressing and re-rollers and sheet makers are finding things difficult, to say the least. Galvanized sheets, both flat and corrugated, continue in fair demand and output is maintained at the level of the past few weeks.

The production of special alloy and high carbon steels for the engineering trades is fairly good, but makers of bright drawn bars would be only too glad to receive further orders to implement their existing meagre commitments. The call for colliery requirements continues well below normal.

Mr. ROYDEN MANSFIELD is to become secretary of Cowlishaw, Walker & Company, Limited, makers of coal-face machinery, power presses, etc., of Stoke-on-Trent, in succession to Mr. F. J. Smith, who retires this weekend.

Higher Half-year Trading Profits by AEI

IN the first half of 1961 group trading profits of Associated Electrical Industries, Limited, rose to £9,110,000, compared with £8,230,000 in the similar period last year and, after depreciation and interest of £4,320,000, the group profit in the first six months of this year was £4,790,000, against £4,490,000 last year. An interim dividend of 1s. per £1 ordinary unit is declared in respect of 1961, which equals the first two quarterly dividends paid for 1960. A total of 3s. per unit was paid for 1960.

The half-year's profit on the sale of investments and miscellaneous assets is £100,000 (£450,000), and after deducting outside interests, the six months' group profit, before tax, attributable to the parent company is £4,730,000 (£4,270,000). Value of output in the first six months, excluding inter-trading, was £103,500,000 (£101,800,000). Orders received, mainly for delivery within three years, totalled £106,600,000 (£113,300,000).

First Ore Shipment for Spencer Steelworks

FIRST cargo of iron ore for the Spencer Steelworks of Richard Thomas & Baldwins, Limited, now nearing completion at Llanwern, near Newport (Mon), arrived at Newport Docks last Friday from Labrador. The 11,000-ton motor vessel Iron Age brought 14,500 tons of ore, which was taken by train to the stockyards at the works.

Stockpiling of raw materials will gain momentum between now and next spring when the plant is due to begin production. Then the blast furnaces will consume some 4,000,000 tons of ore a year, most of which will be imported through Newport. In the first stages the works will produce 1,400,000 tons of steel ingots a year and will employ about 6,000 workers.

GOODLASS WALL & LEAD INDUSTRIES, LIMITED—The company has made an offer for all the issued share capital in Cox Bros. & Company (Derby), Limited, lead and paint makers. In the event of the offer becoming unconditional, it is the present intention that the business should be continued for the time being in its own name. Mr. J. M. Dove, present chairman and managing director, together with Mr. Guy Smith, a director, will retire if the offer becomes unconditional, but Mr. W. Spiegler and Mr. F. A. Walklate will continue as directors, together with other directors nominated by Goodlass Wall.

Coalfield News

COAL AND COKE shipments from the Hartlepools during the 36 weeks ended September 10 amounted to 980,412 tons oversea and 12,470 tons coastwise, compared with 900,617 tons and 29,403 tons last year.

FOR ECONOMIC reasons Durham Divisional Coal Board has decided to close Tanfield Lee Colliery in the No. 6 (North-West Durham) Area. The closure will take place during the next 12 months, but it is expected that there will be little redundance among the 670 miners employed.

AT BARNSLEY ON Monday, the Yorkshire Area Council of the National Union of Mineworkers decided to refer to a special sub-committee the question of a price list for contract workers in the pits. It was a price-list dispute which started the Yorkshire coalfield strike this year.

FORMERLY EMPLOYED as a miner at Markham Colliery, East Midlands Divisional Coal Board, Mr. Robert Heath (26), who recently completed a three-year course at Ruskin College, Oxford, has been awarded a travelling scholarship to McGill University in Montreal for two years.

MEMBERS OF PARLIAMENT for the County of Durham visited Durham Divisional Coal Board yesterday (Thursday). After meeting the board one party of MPs visited Wearmouth Colliery, in No. 1 Area, while the second party visited the Tursdale training centre and central workshops in No. 4 Area.

AS A RESULT of being compensable accident free from April 3 to July 1 and also having had the luck of the draw, 51 employees of the Durham Divisional Coal Board, most of them accompanied by their wives, left last Friday by air for a weekend in the Isle of Man. The trip was part of the board's safety campaign.

WITH THE COMPLETION of annual holidays, overall productivity in the Durham Division of the NCB during the 37th week of the year again averaged more than 23 cwt. The average of 23.10 cwt. per manshift compares with 22.53 cwt. in the same week a year ago. At the face, productivity reached 65.65 (64.69) cwt. per manshift.

THE IMPROVEMENT in coal and coke shipments from South Wales ports was maintained last week, when a total of 76,568 tons, the second best this year, was despatched. The previous highest was only a fortnight ago when 77,618 tons were shipped. Compared with the corresponding period last year there was an increase of 32,675 tons.

AT A MASS MEETING of the 1,100 strikers from the Bedwas Colliery (Mon), held on Sunday, it was decided to return to work immediately. The men agreed to accept proposals by the National Coal Board, for the closure of one district of the colliery and the deployment of labour. It was the first dispute at the colliery for three years.

COAL SHIPMENTS from Blyth (Northumberland) during August amounted to 519,297 tons, compared with 283,344 tons in August last year, when there was a strike of collier crews. The figures for the first eight months of this year are 4,553,447 tons against 3,557,113 tons a year ago. Foreign shipments this year are 500,126 tons, an increase of 77,000 tons.

POINT OF AYR COLLIERY (Flintshire), has won the John Summers trophy presented by the Flintshire Industrial Savings Council for the firm with 500 or more employees having the best savings record over a six-months period. The colliery last won the trophy in 1953 when 720 men saved £4,296. This year although the number of men employed had dropped by 100, savings totalled £5,134.

Growing Contribution from Open-cast Coal

RELAXING of restrictions on open-cast coal mining is reflected in the output figures which are increasing steadily and last week reached 176,000 tons, compared with 138,000 tons in the comparable week a year ago. So far this year 6,313,600 tons has been won from open-cast sources, 600,000 tons more than in the first 38 weeks of 1960. Deep-mined output is also better at 3,673,000 tons and is almost the same as last year. The margin between the outputs for 1960 and 1961, at one time about 6,000,000 tons, has been reduced to just over 4,200,000 tons.

There were 563,730 wage-earners on colliery books on September 16, against 589,770 on September 17, 1960, the numbers engaged at the coal face being 211,160 and 223,940 respectively. Total absenteeism (all workers) in the week ended September 16 was 15.33 per cent., compared with 14.88 per cent. in the week ended September 17, 1960. Output at the face was 4.147 tons and overall 1.445 tons in the week ended September 16, compared with 3.945 and 1.392 tons in the week ended September 17, 1960.

The following table gives (in tons) the provisional figures of output of saleable mined coal by division in the week ended September 23, and the tonnage lost through disputes:—

Division.	Week ended September 23, 1961.		Week ended September 24, 1960.
	Total output.	Tonnage lost.	Total output.
Scottish ..	342,000	16,000	325,000
Northern (N&C) ..	238,000	—	247,000
Durham ..	448,000	—	463,000
North-Eastern ..	801,000	23,000	815,000
North-Western ..	235,000	1,000	258,000
East Midlands ..	897,000	2,000	855,000
West Midlands ..	280,000	—	270,000
South-Western ..	359,000	10,000	374,000
South-Eastern ..	29,000	—	30,000
Great Britain—			
Deep-mined coal ..	3,629,000	52,000	3,637,000
Open-cast coal ..	177,000	—	138,000
Other deep-mined (including licensed mines) ..	43,000	—	42,000
TOTAL	3,849,000	52,000	3,817,000

Old Derbyshire Miners to Get Concessionary Coal

DESPITE a threatened deficiency of more than 9,000 tons in the Derbyshire miners' concessionary coal allowances, it is intended next year to extend the concessionary scheme to include all retired colliers and their widows. Just how this is to be done has not yet been decided, said Mr. Bert Wynn, secretary of the Derbyshire branch of the National Union of Mineworkers, on Monday. At the moment many retired pit workers do not get free fuel under the agreement, because they worked in mines which closed down before nationalization and before the scheme was started.

A suggestion to counter the deficiency, whereby miners should give up a further 13 cwts. of their concessionary coal to the pool has been rejected by the union branches. A compromise solution is now being discussed by the branches whereby miners should be asked to give up 6 cwt. a year to the pool and beneficiaries from the pool should get a ton less each year.

THE COAL TRADE

GROWING demand for smokeless fuels is to be expected, but the fact that it is not limited to areas where smokeless zones are in force, gives credence to the suggestion that many householders are trying out various types of these fuels before smoke control comes into force and some merchants have noted that customers have switched to smokeless fuels long before there is any statutory necessity to do so. This is a contributory factor to the persistent brisk trade in most smokeless varieties and is one of the reasons why little can be spared to go into stock.

DURHAM AND NORTHUMBERLAND

Some improvement in demand from the iron and steel industry is hoped for as October approaches, but current indications do little, as yet, to justify that expectation; nor have iron ore imports to the North-East foreshadowed it. These have been running at a lower level, as have orders for heavier steel descriptions and more notably ships' plate.

The situation is reflected in the demand from the industry for Durham coking coal and industrial cokes. The easier trend coincides with the comparatively recent operation of new coking plant in Durham. The market as a whole, however, maintains its steady position. North-east Coast coal shipments, both coastwise to London and elsewhere, show an expansion in demand rather more than was expected. Coal exports have also been at a somewhat higher level but coke exports are lower.

Durham and Northumberland good class steams maintain their active trade and Durham gas coal moves on with more seasonal interest.

NORTH WALES

Merchants continue to be busy endeavouring to satisfy householders' requirements, but shortages of some of the popular grades is slowing down completion of orders. Very little additional coals are on offer, and every opportunity is being taken to lay down ground stocks, which are very meagre compared with this time last year. The usual seasonal increase in the demand for all grades of coke is now very pronounced, and adequate tonnages are to hand.

The call for anthracite and Phurnacite is incessant, with very little tonnage coming forward; other smokeless fuels such as Coalite are fully booked, and delays in despatch run into several weeks. The requirements of industry are catered for satisfactorily.

SCOTLAND

Glasgow.—Although the recent fine weather has reduced the retail demand for house coal to a marked degree, merchants are still very busy and the breathing space has not been unwelcome. It has enabled the trade slightly to close the gap in depot stock compared with a year ago, and the total at 227,000 tons contrasts with 259,000 tons in 1960. The shortfall is considerable when viewed against the narrow escape from a severe shortage at one point last winter, but more important is the fact that the stock is not evenly distributed. This applies particularly to the Border counties served by Northumberland pits, from which supplies are not forthcoming in the way merchants would like. A more general complaint is the inability to secure the qualities desired.

There are substantial quantities of doubles accumulated at collieries in the central areas. These are of coking quality and have arisen from the cut-back in deliveries to the iron and steel industry. If they have to be disposed of in the domestic market they will involve a financial loss, but they may prove a fortuitous source of supply before the winter is through. Demand for doubles generally is improving.

The industrial position is fairly comfortable, although there is a tendency to ease off because of unseasonally low space-heating loads. Electricity smalls are turning slightly quieter—a reflection of the fact that stock at the different power stations aggregates 610,000 tons against 450,000 tons last year. Coking smalls are a drug on the market, and the undistributed surplus is being added to at the rate of several thousand tons a week. Anthracite nuts are tight, and augmentations from South Wales are proving helpful. Manufactured fuels meet a better demand, with Coalite considerably in arrears.

Fife and Lothians.—Output in these zones is disappointing, and there are difficulties in meeting commitments in house coal, deliveries at times being several weeks in arrears. The industrial sector is not affected to the same extent. Export trade is featureless.

Coal Chartering

CHARTERING from the Hampton Roads area has been on a more active scale with tonnage fixed to the major receiving areas. As far as Japan is concerned, a 13,000-tonner has been fixed for October/November at $9.40, 11,500 tons to Tokyo Bay at $9.25 for end September/October 15 cancelling, 20,000-tonner for November 1-30 at $9.35, and 12,000 tons to Osaka for October 20/November 10 at $9.40, all with six days Shinc. Charterers continue to show interest in forward positions and are still prepared to consider some contracts. Hampton Roads/West Italy paid $4.70 for 12,000 tons with 3,000 tons free for October, but later 9,500-tonner to Savona for October 20/November 10 at $4.60 and 14,000-tonner to Venice at $5.60 with 2,000 tons free for October shipment.

As far as the Continent is concerned 14,000 tons has been taken for Antwerp, Rotterdam, or Armsterdam at 31s. 6d. for two consecutive voyages commencing November, but it is now reported that some 35,000 tons has been fixed to same destinations at 33s. To the Brazils 13,000 tons was recently taken for Santos at $7.50 for October 12-30. Newcastle N.S.W./Wakamatsu reports 10,000 tons for October 5-30 at 46s. f.i.o. and trimmed.

Outwards from the Continent is quiet although business is available from Rotterdam to the Mediterranean and miscellaneous business is quoting from the Continent to America. There is little of interest to report from the UK, irrespective of destination, although charterers are apparently interested in tonnage to West Italy. Coasting demand is maintained.

Board Changes

Garrard Engineering's New Directors

BOARD of directors of GARRARD ENGINEERING & MANUFACTURING COMPANY, LIMITED, which recently became a wholly-owned subsidiary of the Plessey Company, Limited, has been reconstituted. New directors are:—Mr. A. E. Underwood (chairman), Mr. Hector V. Slade (managing director), Mr. K. J. Slade, Mr. J. Tyldesley, Mr. John A. Clark and Mr. Michael W. Clark.

Plessey also announces that Sir William Stanier has resigned from the Garrard board and has been appointed a director of MACHINE PRODUCTS, LIMITED. Mr. Donald F. Brown has also resigned from the Garrard board and has joined the board of Hawley Products, Limited. Machine Products and Hawley Products are members of the Plessey group.

MR. R. H. E. THOMAS

Former marketing member of the National Coal Board, who resigned in June last year, Mr. R. H. E. Thomas has been appointed to the board of BURNETT & HALLAMSHIRE HOLDINGS, LIMITED, coal merchants, of Sheffield.

Earlier this year he rejoined, as commercial adviser, Renwick, Wilton & Dobson, Limited, coal distributors, of Torquay (Devon), with which company he started his career in 1912.

CEMENTATION COMPANY, LIMITED—Sir Alexander Sim has been appointed a director.

MILLSPAUGH, LIMITED—Mr. R. Sternberg has been appointed a director and vice-chairman.

STANDARD RANGE & FOUNDRY COMPANY, LIMITED—Mr. Robert Jolliffe has been appointed sales director.

GRIFFIN & GEORGE (SALES), LIMITED—Dr. Dennis S. Beard has been appointed to the board as technical sales director.

ROBERT HARRIS, LIMITED—Mr. Francis Jones has been appointed managing director of the company which is now the metal pressings division of the Villiers Engineering Company, Limited.

ARMSTRONG WHITWORTH (METAL INDUSTRIES), LIMITED—Mr. Austin W. Scott has been appointed to the board. He joined the company in 1949 and continues as works manager of the Jarrow Foundry division.

ALBION MOTORS, LIMITED—After being with the company for 51 years Mr. H. J. Camplin has resigned as a director. He was appointed London Area manager in 1946 and to the board in 1954. After the integration of Albion and Leyland Motors, Limited, he became the group's southern divisional manager.

BRITISH MANUFACTURE & RESEARCH COMPANY, LIMITED—Previously chief engineer and works manager, Mr. A. W. Kuijverhoven has resigned his directorship and has also ceased to be associated with the parent concern, the Hispano-Suiza group, whose chief engineer he has been for the past two years at Geneva.

WANKIE COLLIERY COMPANY, LIMITED—Mr. K. C. Acutt has resigned from the chairmanship as he is now resident in England, but is remaining on the board. Mr. P. H. A. Brownrigg, who was appointed a director in Rhodesia of the Anglo-American Corporation of South Africa, Limited, succeeds Mr. Acutt as chairman.

STAVELEY INDUSTRIES, LIMITED—Mr. John T. Lewis, who is deputy chairman of Wellington Tube Holdings, Limited, has been appointed a director of Staveley Industries. On his appointment to the parent company board, he relinquishes directorships of two Staveley group companies, Bradley & Foster, Limited, and Birmingham Chemical Company, Limited.

FORD MOTOR COMPANY, LIMITED, Dagenham (Essex)—Mr. C. Thacker has been appointed deputy chairman in addition to continuing as managing director, and Mr. J. A. Barke assistant managing director of the company, with responsibility for the operating groups and divisions, as well as for all central staff activities. Mr. J. M. A. Smith, after 31 years' service, intends to leave the company as from December 31. He was elected to the board in 1953 and became assistant managing director in the same year.

KUKATUSH MINING CORPORATION (1960), LIMITED—Mr. Allan Cavanagh MacDonald has been appointed president and chief executive officer. He recently resigned as executive vice-president of A. V. Roe Canada, Limited, and was formerly a director and vice-chairman of Dominion Steel & Coal Corporation, Limited, and director and chairman of a number of other Canadian companies. In addition to his new appointment he will continue as director of Lyman Tube & Supply Company, Limited.

Increased Output by W. G. Allen & Sons

CHAIRMAN of W. G. Allen & Sons (Tipton), Limited, colliery, light railway, and mechancial engineers, etc., Mr. R. Hampshire says in his annual report that although profit margins are still keen and skilled labour more difficult to obtain, the order-book in total represents more than nine months' work, and output from all the group companies for the first four months of the current year has increased. If the present trend continues, he adds, the undertaking will be in a much better position when the time comes to consider the 1961-62 dividend policy next spring.

With steel, the main material, now in much easier supply and with a bigger order-book, Mr. Hampshire explains, it is possible to plan production more accurately, with consequent reduction in the money which has had to be tied up in day-to-day production materials, while, in addition, no substantial payment for tax is due until January 1, 1963.

AS PART OF its £12,500,000 expansion programme, Associated Engineering, Limited, vehicle and aircraft component manufacturers, has bought for about £400,000 the 240,000 sq. ft. factory at Bridgwater (Somerset), which Wilmot Breeden, Limited, has announced it would be closing down. By mid-October, the Wellworthy, Limited, division of Associated Engineering will have the first line of machines making diesel engine pistons in action and the dual operation will be completed by the end of the year.

Company News

Bruce, Peebles—Belmos Merger

GREATER DIVERSIFICATION AND RAPID DEVELOPMENT

ON behalf of Bruce, Peebles & Company, Limited, manufacturing electrical engineers, of Edinburgh, Hambros Bank, Limited, has made a share exchange offer for the capital of the Belmos Company, Limited, makers of colliery and industrial switchgear, of Bellshill (Lanarkshire). The offer is on the basis of one Bruce Peebles 6½ per cent. cumulative preference £1 share for each Belmos 6 per cent. cumulative preference £1 share (£75,000) in issue and 11 Bruce Peebles 10s. ordinary shares for every two Belmos £1 ordinary shares (£248,924).

It is proposed that the existing Bruce Peebles 7½ per cent. cumulative participating preference be converted into 6½ per cent. cumulative preference and that a scrip issue of two new 6½ per cent. preference be made for every £3 of the 7½ per cent. preference.

In a letter to shareholders, Mr. Thomas Coughtrie, who is chairman of both companies, states that the business of both companies is complementary in regard to range of products and there has been built up over the years a "friendly and close" relationship between them. Diversification by Bruce, Peebles will be advanced considerably by the proposed amalgamation with a concern which has already undertaken a considerable degree of diversification in order to provide a service in the field of power engineering and control. A closer relationship between the various research activities of the two companies will lead not only to economy, but also to a more rapid development of new products, processes, and techniques, and a better deployment of sales effort.

The scheme has the full approval of the boards of both companies and Hambros Bank considers the proposals to be fair and reasonable.

BRIGGS COLLIERIES, LIMITED—All assets of the company, which is in voluntary liquidation, have now been realized and liabilities discharged.

DANIEL ADAMSON & COMPANY, LIMITED, engineers and boiler manufacturers, etc., of Dukinfield (Cheshire)—The company is not paying an interim dividend for 1961. Last year there was an interim of 3 per cent. and a final of 5 per cent.

THOS. HEITON & COMPANY, LIMITED, iron and steel merchants, of Dublin—Net profit for the year to July 31, 1961, amounts to £41,079. Taxation absorbs £16,986, leaving a balance of £24,093. The final dividend is declared at 8½ per cent.

HATTERSLEY (ORMSKIRK), LIMITED, engineers, iron and non-ferrous founders—Acceptances have been received in respect of 100 per cent. of the outstanding ordinary shares of Beck & Company (Meters), Limited, and the offer is declared unconditional.

BROKEN HILL PROPRIETARY COMPANY, LIMITED—The Australian iron and steel concern is paying a dividend of 7½d. a £1 share (Australian currency), the same as in May. A year ago the dividend was 11d. a share, but this was before a one-for-two scrip issue.

HUNT & MOSCROP, LIMITED, engineers to paper makers and textile finishers, of Manchester—Group net profits for the year ended June 30, 1961, expanded sharply to £53,946 (£26,153) after tax of £54,258 (£33,588) and the dividend is raised to 15 (12½) per cent. with a final of 7½ per cent.

S. E. OPPERMAN, LIMITED, engineers, gear cutters, etc., of Boreham Wood (Herts)—A cash offer of 3s. per 2s. share for the £311,183 capital has been received from the Export Tool Group, Limited, of London, W.1. Full acceptance would involve a payment of over £466,000. The offer is being considered.

BELLS ASBESTOS & ENGINEERING HOLDINGS, LIMITED—An interim dividend of 7½ per cent. on the 5s. ordinary shares has been declared. Subject to the approval of an extra-ordinary general meeting, it is proposed to issue 2,193,280 new ordinary shares of 5s. each, credited as fully paid, to ordinary shareholders registered on October 27, 1961, in the proportion of one-for-two.

CEMENTATION COMPANY, LIMITED—The company incurred a group net trading loss of £202,274 for the year to March 31, 1961, against a previous profit of £425,800, and there is no ordinary dividend, as before. Provisional results, considered to be a reliable guide, for the first five months of the current year, indicate a net profit of £150,000 after all charges, compared with the loss of £100,000 during the same period last year.

CROSSLEY BROS., LIMITED, manufacturers of diesel locomotives, marine and gas engines, of Manchester—Dividend at 5 per cent. for the year to April 30, 1961, is being maintained. Net profit is up to £19,506 (£14,811) after tax of £19,290 (£1,230). Net profit of Crossley Premier Engines, Limited, controlled by Crossley Bros., rose to £17,403 (£6,762), after tax of £15,700 (£6,000). Dividend is 15 per cent.

DOXFORD & SUNDERLAND SHIPBUILDING & ENGINEERING COMPANY, LIMITED—As forecast a final dividend of 10 per cent. is recommended on the increased capital. Profits of the Doxford group, before tax, fell from £1,248,318 to £819,361 for the year to end-June and those of the Sunderland Shipbuilding Dry Docks & Engineering Company, Limited, acquired under the June merger, from £1,017,761 to £796,365 for the year to March 31, 1961.

QUALCAST, LIMITED, light repetition ironfounders, etc., of Derby—The final dividend of 11 per cent. makes 18 per cent. for the year to June 30, 1961. The previous year's total was equal to 17 per cent., adjusting for a 50 per cent. scrip issue. Had it not been for the Chancellor's request, a higher dividend would have been recommended, the directors state. Group trading profit increased to £1,767,386 (£1,611,453) and the profit, before tax, is increased to £1,411,824 (£1,311,783).

BRITISH WAGON COMPANY, LIMITED—Announcing a

maintained 5 per cent. interim dividend, the directors report that group profit for the first six months of the year compares closely with that for the similar period in the previous year. The directors find it difficult at this stage accurately to forecast the year's results, and the final dividend recommended will obviously depend on the outcome of the remainder of the year's trading. The final dividend last year was 7½ per cent.

CAPPER PASS & SON, LIMITED, smelters and refiners, of North Ferriby (Yorks)—Decline in group net profits from £202,463 to £176,280 in the year ended March 31, 1961, was due, states the chairman, Lord Fraser, to the long-standing custom of bearing the ups and downs in world metal prices instead of "hedging" them on the London market. A very extensive modernization and plant streamlining plan to reduce costs is now nearing completion and the scheme is to be embarked on with a view to completion within two or three years.

CAMMELL LAIRD & COMPANY, LIMITED, ship builders and repairers, boilermakers, etc., of Birkenhead—Interim dividend of 3 per cent. in respect of 1961 is being maintained, but, the directors state, "it is unlikely that the rate of dividend for the year as a whole will be maintained." A total of 12 per cent. was paid for 1960. There has been a falling off in the demand for steel plates and railway rolling stock, which, coupled with the difficulties in the shipyard, will, it is expected, result in an "appreciably lower group profit for the current year."

WM. CORY & SON, LIMITED—In view of industrial unrest at home and economic uncertainty oversea, the results are not unsatisfactory, states the chairman, Mr. F. A. Leathers. Even the traditional coal side of the business had improved as a result of concentrating facilities in the Thames to the minimum essential for the servicing of the coal. Implications so far as the company was concerned of the UK entry into the Common Market were being studied and every opportunity taken of increasing business in Europe through the subsidiary and associated companies on the Continent.

SPARK HOLDINGS, LIMITED, holding company for engineering, metallurgy, foundry, concerns, etc.—A final dividend of 27½ per cent., is recommended, making 45 per cent. for the year to April 30, 1961, against not less than 37½ per cent. forecast on capital doubled by last December's scrip issue. For the previous 13 months the equivalent total was 25 per cent. A further capitalization is proposed on a one-for-five basis to ordinary or "A" ordinary holders. After tax of £235,153 (£109,500) the net profit, including that of newly acquired subsidiaries for periods up to 16 months, is £220,834 (£125,271).

English Electric Wins £6,000,000 Cairo Order

WON in the face of strong foreign competition, the English Electric Company, Limited, has been awarded a £6,000,000 contract for a 120,000 kW extension to the Cairo South Power Station. The order is one of the largest given to a British company since 1957, and it is understood that English Electric has agreed to accept a share of the Egyptian cotton crop as part payment.

English Electric will supply two 60,000 kW steam turbines, alternators, transformers, 63,000 volt switchgear, low voltage switchgear and fuse gear. Four boilers, each of 441,000 lb. per hour capacity, will be made by Simon-Carves, Limited, Stockport. The plant will be in operation early in 1964.

Short-time Working Hits United Steel

ALL the main steelmaking units of the United Steel Companies, Limited, group, which employs some 40,000, are now affected by short-time working because of falling orders. Most significant of all is the fact that Samuel Fox & Company, Limited, Sheffield, which employs over 8,000, has reduced shifts in its open-hearth melting shop from 19 to 16 a week, from 18 to 16 in the electric melting shop, and from 17 to 15 in the billet mill.

At the Appleby-Frodingham Steel Company, Scunthorpe, the plate mill has dropped from 17 to 12 shifts a week, and at the Workington Iron & Steel Company, steelmaking is being reduced from Monday from 17 to 15 shifts, and a fishplate mill from six to four shifts.

Some weeks ago the Steel Peech & Tozer branch of the group at Rotherham declared some temporary workers redundant when it reduced the number of furnaces in operation to prevent an excess building of stocks. Mills there have also been on shorter weeks for some months.

Mr. R. Swinden, works manager (services), of Samuel Fox & Company, said on Saturday that as soon as the demand for steel increases, the company will be better equipped to cope with the situation because of extensive expansion which has taken place and is still being undertaken. He was speaking at a party at Stocksbridge for retired employees and their wives.

RESIDENTIAL HALL FOR S&L STUDENTS

RESIDENTIAL hall at Corby (Northants) for students employed by Stewarts and Lloyds, Limited, was officially opened on Tuesday by Mr. L. M. T. Castle, managing director, finance and administration. The hall, which has cost in the region of £150,000, will provide accommodation for 65 students.

It is mainly for young men in the firm's student apprenticeship scheme to which the minimum standards of entry are those required for entry to a university or to a course leading to the Diploma in Technology. The hall will also accommodate students ranging from commercial student apprentices and technical and craft apprentices to university vacation students and students from abroad.

Specialist Library Scheme Suggested

SPEAKING at the Library Association conference at Hastings (Sussex), on Thursday of last week, Viscount Caldecote, managing director of English Electric Aviation, Limited, and a director of the English Electric Company, Limited, and D. Napier & Son, Limited, suggested a scheme whereby small firms, which could not afford an industrial library, could use the facilities of large companies.

He suggested that companies in specific industries should contribute to a library service undertaken by their research organization, each to confine its contribution to its particular specialist field. In this way, a vast body of knowledge and material could be built up, readily available to all members of the group, but with costs evenly spread where they could best be borne.

NEWS IN BRIEF

A RAILWAY is to be built in Swaziland which will provide a link between the iron-ore deposits at Ngwenya and the port of Lourenço Marques. Exploitation of the deposits will then follow.

NEARLY 6,000 PEOPLE, families and friends of employees of the Davy-United Engineering Company, Limited, visited the Darnall, Sheffield, works last Saturday during the company's open day.

UNDER THE SUPERVISION of Mr. H. E. Farrar, area manager, assisted by Mr. G. H. Sharp, senior sales engineer, George Kent, Limited, has opened an office at Lloyds Bank Chambers, Earl Street, Sheffield 1 (telephone: Sheffield 77471/2).

ALLIED IRONFOUNDERS, LIMITED, has disposed of its interest in Lundell (Great Britain), Limited, makers of agricultural machinery, to John Deere, a US manufacturer of farm machinery, some of whose products Lundell has produced under licence for many years.

IN THE CAPTION to the illustrations of Birmingham's new Engineering and Building Centre, which appeared in IRON AND COAL on September 15, it was inadvertently stated that the centre was to open the following week. It is, of course, to be opened early next year.

THE mobile demonstration unit of Avo, Limited, on Monday began a two-month tour of five countries—Western Germany, Italy, France, Switzerland, and Yugoslavia. The self-contained unit carries the full range of Avo electrical, electronic, and nucleonic test equipment.

A REDUCTION of £450 has been made in the rateable value of the Pontymister steelworks of Partridge Jones & John Paton, Limited. Previously the rateable value of the works was £9,250, over 10 per cent. of the local council's total rateable value. The reduction is to be back-dated to April, 1960.

IMMEDIATE setting up of a mineral and gas development corporation has been decreed by the Pakistan Government. With the funds of Rs. 50,000,000, it will undertake the exploration, development, refining, and sale of minerals, gas, and metals. It will be managed by a three-man board.

MEMBERS of the South Staffs section of the National Trades Technical Society visited the Sheffield works of Samuel Osborn & Company, Limited, manufacturers of high-speed tool steel, forgings, etc., on Wednesday of last week, to see modern foundry techniques and developments.

FIRST STEP towards the operation of the Spencer Steelworks of Richard Thomas & Baldwins, Limited, Llanwern (Mon), took place on Tuesday when the 100,000,000-gallon reservoir at Waltwood Hill began to fill. The reservoir will eventually provide the works with 20,000,000 gallons of water a day.

ARRIVING AT Goole (Yorks), at 3.45 p.m. last Friday, the motorship, Rose Julie, was loaded with 415 tons of coal in 65 minutes at the 32-ton hoist and sailed at 6.35 p.m. on the same tide. Another speedy operation at the same hoist was the loading of the motorship Steyning with 1,881 tons of coal in six hours.

A NEW, FULLY AUTOMATED, sinter strand, which will supply 12,000 tons of sinter a week for the company's two blast furnaces, has started production at the Shotton, near Chester, steelworks of John Summers & Sons, Limited. The line was supplied by Huntingdon, Heberlein & Company, Limited, London, W.1.

A CREDIT OF $6,500,000 (about £2,300,000) has been authorized by the US Export-Import Bank to the Japan Steel & Tube Corporation, of Tokyo, third largest steel producer in Japan. Proceeds of the credit will be used to purchase US equipment for expansion of a steel plant located in the Tokyo-Yokohama area.

MR. JOHN CARTER, technical representative for Sintered Products, Limited, Sutton-in-Ashfield (Notts), a member company of the Sheepbridge Engineering Group, for the area covering Derbyshire, Yorkshire and the North-east, will in future include Lancashire, North Wales, and North-west England in his itinerary.

CONFERENCE on large forgings was held at Terni, Italy, from Tuesday to Friday this week. It was convened jointly by the Camera di Commercio, Industria e Agricoltura, Terni, and Associazione Italiana di Metallurgia, Milano. The 25 papers presented included contributions from Britain, France, Germany, Switzerland, and the US.

LONDON OFFICE of Handy Angle, Limited, manufacturers of slotted angle, shelving, and materials handling equipment, is to be moved to Hayes (Middx) to provide better office accommodation and storage facilities which are not available at the existing office. Handy Angle is a subsidiary company of Wagon Repairs, Limited.

UNLESS THE UK lifts or eases import restrictions on Japanese goods by December, British goods may not be allowed to share in the 70 per cent. liberalization of Japan's import trade proposed for that date. The Japanese Cabinet has approved a graduated programme to free 90 per cent. of Japan's import trade by October next year.

AMONG THOSE present at a luncheon held to celebrate the 50th anniversary of the Blyth firm of Hughes Bolckow Shipbreaking Company, Limited, was Vice-Admiral J. Hughes-Hallett, Parliamentary Secretary to the Minister of Transport, and Sir Charles Westlake, chairman of Metal Industries, Limited, of which group the company is a member.

AMONG IMPORTANT new discoveries of natural gas made in Italy in the past few months, the most recent is near Vasto on the Adriatic Coast of the Abruzzo region. Ascertained reserves in these fields amount to 12,500,000,000 cu. metres of methane, but the indications are that this figure will greatly increase as research proceeds in the area.

ACTUAL PRODUCTION of raw steel in the US during the week ended September 25 totalled 2,114,000 net tons, according to the American Iron and Steel Institute. This was a 4 per cent. increase, compared with the 2,032,000 tons produced in the preceding week. Production for 1961 so far totals 63,318,000 (78,243,000) tons—a 12.7 per cent. decrease.

AT THE ANNUAL CONFERENCE of the Institute of Personnel Management at Edinburgh from October 5-7, Lord Robens, chairman of the National Coal Board, will give an address on "Social Aspects of Industry." Mr. S. P. Chambers, chairman of Imperial Chemical Industries, Limited, will give the opening address on "Economic Aspects of Business Enterprise."

PROPOSAL BY THE Tyne and Blythe district committee of the Confederation of Shipbuilding and Engineering Unions, that the present 24-hour notice given to shiprepair workers when they are paid off from local yards should be extended to three days, has been rejected by the North-East Coast Ship Repairers' Association. The association informed the unions that the three-day notice would be quite impracticable to operate.

TWIN PROBLEMS of co-operation and communication

between the various levels of industry are to be studied by the Merseyside branch of the British Institute of Management. The chairman, Mr. G. E. Beard, said there was still not enough team work in industry and it would have to be improved if Britain was to hold its place in the Common Market. Economy of effort and good team work might mean the difference between success and failure.

DANISH marine diesel manufacturers, Burmeister & Wain, has formed a UK subsidiary, Burmeister & Wain (Great Britain), Limited, with offices at 115, Leadenhall Street, London, E.C.3. The new company will represent its Danish parent in all its activities in the UK, and will provide liaison with its sole British licensee, Harland & Wolff, Limited, Belfast, and with sub-licensees, John G. Kincaid & Company, Limited. Mr. Jorgen Berring is manager of the new company.

TO MEET an expected heavy demand for Phimax this winter the North Western Gas Board has arranged to start production at its Wigan Works, with an initial weekly output of 1,200 tons. Sales, at present restricted to the greater Manchester, central Lancashire, north Cheshire, and Wirral areas, will thus be extended to the board's south Lancashire group. Supplies will be available to merchants as from October 25 and to the general public on November 1.

A HOUSE SCHEME between Samuel Fox & Company, Limited, Stocksbridge, a member of the United Steel Companies, Limited, and Stocksbridge Urban Council has been modified so that only 80 per cent. of the houses being built are to be let to the firm's employees. The other 20 per cent. will be let by the council. Under an agreement with the council, the company, which is contributing £112,000 to the cost of providing 500 houses, had the right to select first letting tenants, but agreed to the modification at a joint meeting last week.

A GENERATING TRANSFORMER made by Bruce, Peebles & Company, Limited, in Edinburgh for the Kincardine power station 24 miles away will have to travel more than 600 miles before it can reach its destination. The Scottish Home Department has told the manufacturers that it will be necessary to take the equipment, which weighs 200 tons, by road to Glasgow, ship it from the Clyde round the coast to Rosyth, and then complete the journey by road. Lack of cranes large enough to lift the transformer has left only Glasgow and Rosyth as exit and entry ports and there is no alternative land route.

CLAIM FOR A wage increase for 3,000,000 workers, understood to be in the region of £1 a week, was put before the Engineering Employers' Federation by the Confederation of Shipbuilding and Engineering Unions on Wednesday. The claim, if met, would cost the employers about £150,000,000 a year. The unions also asked for a reduction of two hours in the present working week of 42 hours, and for equal pay for women in engineering—claims which would cost a further £200,000,000. The claims will be passed on for consideration by the individual members of the employers' federation.

REPRESENTING 13 countries, a party of 20 oversea agents of Henry Wiggin & Company, Limited, manufacturers of nickel and nickel alloys, of Birmingham, has this week been on a three-day visit to the company's new works at Hereford. The visitors made a tour of the plant and laboratories and saw a special exhibition featuring applications of corrosion-resistant materials, which are one of the three main types of specialized alloys produced by the company. It is claimed that when the plant is completed in 1965, it will be the largest and most modern of its kind in the world.

Ceylon's Steel Industry

DURING a debate in Colombo on a Government motion for the provision of initial capital not exceeding Rs.80,000,000 (£6,000,000) to the Iron and Steel Corporation, it was stated that the Ceylon Government is proceeding with the scheme to set up a steel rolling mill with Soviet aid to produce 35,000 tons of products from imported billets. The Government has put off a decision on two other stages of production recommended in the Russian Project Report.

It was proposed that in the latter two stages there should be established two open-hearth furnaces to smelt steel scrap and imported pig-iron and, after that, a charcoal blast furnace to smelt ore to produce pig-iron. The Rs.80,000,000 would cover the capital cost of the first stage of the project; the full cost of all three stages being Rs.158,400,000.

A Government White Paper states that there are at least 2,500,000 tons of iron ore in Ceylon which could be economically mined and would meet requirements for 20 to 25 years. The Russians, who had tested a sample of Ceylon rubber tree timber, believed that rubber wood charcoal would be a suitable substitute for coke for the blast furnace.

It is estimated that the rolling mill would yield a net profit of Rs.1,000,000 a year and save Rs.10,000,000 in foreign exchange. The cost of production is estimated at Rs.724 a ton which could be reduced to Rs.635 if output is doubled.

Machine-tool Industry Urged to Improve Research

WARNING that Britain's machine-tool industry was not keeping pace with advances in other spheres was given by Sir Steuart Mitchell, Controller of Guided Weapons and Electronics at the Ministry of Aviation, and chairman of the committee which recently reported on the machine-tool industry, when he spoke at the second International Conference on Machine-tool Design and Research at Manchester on Monday.

Sir Steuart said "enormous" advances had been made in the past 25 years in machine tools in things like cutting speeds, tool life, accuracy, and ability to machine very hard materials, but he did not think that progress in machine tools matched the progress in other fields.

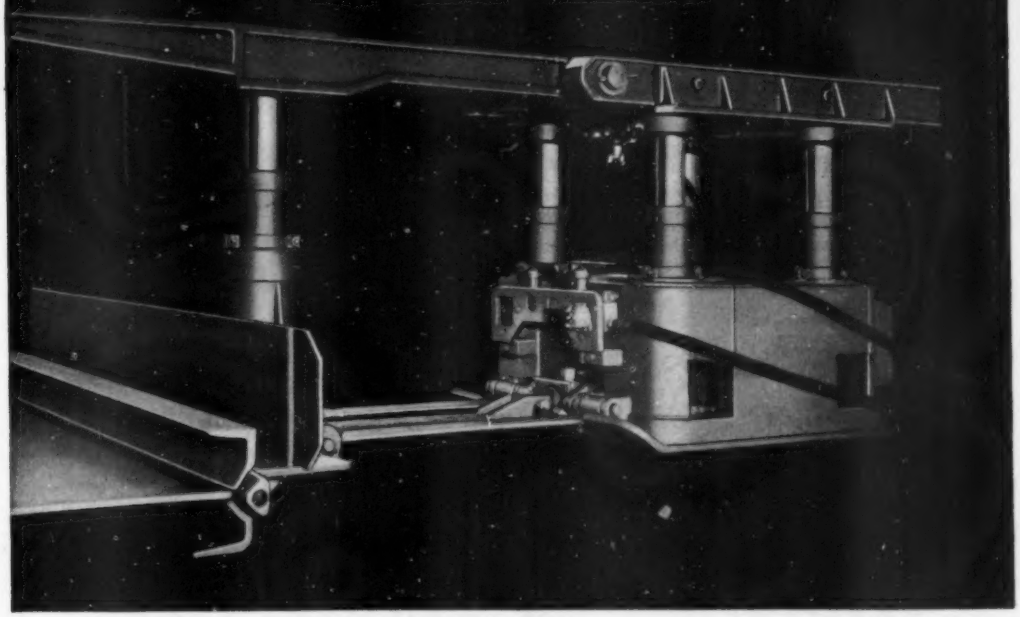
He urged the industry to make greater use of the latest advances in neighbouring technologies, such as electronics, and to build up more composite integrated teams in machine-tool research.

Employers Urged Not to Outbid for Scarce Labour

APPEAL has been issued to members of the British Employers' Confederation not to undermine the wages "pause" by trying to outbid each other for scarce labour. In its fortnightly bulletin, the confederation says: "Employers expanding want to give more pay to get extra labour, just as union leaders want to get extra pay for their members. If the Chancellor's policy is to operate, both wants must remain unsatisfied."

Similarly, says the confederation, wages councils often argue that increases are justified because industries cannot keep workers. "The reply is that national productivity does not justify increases. Bidding up for labour does not increase the number of men available."

THE GULLICK "SEAMAN" POWER ADVANCED SUPPORT for Low Seams



the 5-leg Chock developed from experience has 5 strong points

1. **Strong Waste Edge Support** to give good caving; maintains two rows of support between the Waste Edge and the Operator, and prevents waste flushing.
2. **Front leg, designed to be as close to the face as possible** and providing the forward support required, yet causing the least hindrance to the power loader operator.
3. **Maximum travelling track** provided by good design of roof bar, and Ram arrangement. With this Chock travelling is as good as conventional faces using props and link bars.
4. **Hinged roof bar and three rows of props** in the chock ensure the maximum distribution of load to the roof, throughout the whole width of the face.
5. **Safe hydraulic fluid** (water/soluble oil) together with the other features combine to ensure good roof control and the safest power advanced support yet devised.

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Britain and Engineering Exports

AN analysis of UK engineering exports in relation to those of competing countries made by the British Engineers' Association, reveals that Italian exports of electrical and mechanical engineering equipment went up by 59 per cent. last year, French exports rose by 33 per cent., and UK exports by 10 per cent. More than 40 per cent. of British exports went to Commonwealth countries, 16 per cent. to countries within the European Economic Community and only 9 per cent. to European Free Trade Association countries.

The engineering industry accounts for 27 per cent. of all goods exported from this country. In this category total world exports went up in value last year from £4,317,000,000 to £5,023,000,000. Behind the US and West Germany, the UK share of this total was £945,600,000. Australia was Britain's best customer, taking goods worth £81,800,000, while shipments to India fell by £16,700,000.

Outside the Commonwealth, the UK did well in Latin America, where sales rose £18,600,000, exports to the Argentine going up by 51 per cent. and those to Brazil by 79 per cent. The UK is the third most important seller of engineering products to the Common Market countries, after West Germany and the US. One striking fact which the analysis uncovers is that between 1958 and 1960 France and Italy more than doubled their exports to other members of the Community.

The "Turbinia" Restored for Newcastle Museum

TURBINIA, the first turbine vessel, built by the late Sir Charles A. Parsons, has been restored by Newcastle City Council in conjunction with the North-East Coast Institution of Engineers and Shipbuilders, and is now accommodated in a glass-fronted annexe to the Industrial Museum in Exhibition Park, Newcastle-upon-Tyne.

The annexe was officially opened recently by Admiral Sir Caspar John, First Sea Lord and Chief of Naval Staff, who paid tribute to the work of Sir Charles and unveiled a plaque to his memory. The Turbinia was formally handed over to Newcastle City Council by Mr. J. B. Woodeson, president of the North-East Coast Institution of Engineers and Shipbuilders.

Plessey to Manufacture Guldner Tranmissions

AT a new factory at Swindon, the Plessey Company, Limited, group, is to manufacture a new "hydrostatic" system of transmission for vehicles, capstans, cranes, lifting forks, and other mechanical-handling equipment. The equipment has the trade name "Hydro-Stabil" and is manufactured under licence to Guldner-Moteren-Werke, a member of the Linde group in Germany.

Full production at the new factory is expected by 1963-64. At first complete Guldner equipment will be sold as made in Germany. The assembly of parts will follow and then full manufacture.

Higher Half-year Sales for Vickers

THOUGH the interim report of Vickers, Limited, shows a sales increase of over £9,000,000 for the six months period ended June 30, 1961, compared with the corresponding period last year, directors state that 1961 group net profits may differ little from those of 1960 because a large amount of aircraft sales showed no profit. The interim dividend is repeated at 2½ per cent. A 7½ per cent. final made a total of 10 per cent. for 1960, as for several years past.

Group profits for the first half of this year at £4,710,000, compare with £4,670,000 in the corresponding period of 1960, when, however, the balance was struck after a £1,500,000 provision for aircraft development. No provision in respect of aircraft development appears in this year's half-year figure. Profits for the second half year are expected, as in 1960, to be higher than in the first.

New post of special assistant to the managing director has been established by the company, and it will be filled by Mr. A. L. Cooper, who has relinquished the secretaryship. He is succeeded as secretary by Mr. A. M. Simmers, who also becomes controller of administration, reporting in this capacity to the director of administration.

Mr. Simmers relinquished the secretaryship of the English Steel Corporation, Limited, and his other appointments and directorships in the ESC group last Friday.

Six-point Plan Postponed for Shipbuilding Industry

A SIX-point plan to help the shipbuilding industry was put forward by Mr. John Chalmers, assistant secretary of the Boilermakers' Society, at a conference arranged by the National Council of Labour Colleges, at Newcastle-upon-Tyne.

The plan proposes the appointment of a Minister to exercise Government control over the industry; consultation between the Minister and the Shipbuilding Advisory Committtee; consideration of a scrap-and-build scheme; creation of a workers' charter guaranteeing employment; provision of Government credits; and the allocation of more cash for research work.

Mr. Chalmers said he was tired of hearing that shipyard workers were not pulling their weight, too often, managements made whipping boys of the employees.

BRITISH OXYGEN TO TRANSFER LIGHT ENGINEERING WORK

OVER the next five to six years the British Oxygen Company, Limited, is to transfer its light engineering work at Edmonton, north London, on which about 2,000 people are employed, to a new factory being built near Dumbarton, Scotland. The company's oxygen manufacturing plant will remain at the existing Edmonton works.

The Board of Trade will build the factory at Dumbarton and lease it to British Oxygen, which estimates that it will be over two years before the first stage of the new plant is established. Thereafter, there will be a gradual build-up to a labour force of about 2,000 during the following three to four years.

THE

FIRST

fully mechanised rail borne
ore unloading installation
in British Steelworks is also the

FIRST

major item of production plant to go into
commission in order to build up
imported ore stocks at the great new

SPENCER WORKS
of
RICHARD THOMAS & BALDWINS LTD.

under construction at Llanwern.
This plant comprises an
Automatic Wagon Marshalling Plant &
Tippler Installation

by

STRACHAN & HENSHAW

LIMITED

capacity 1350 tons of imported ore per
hour with wagons under perfect control
from incoming to exit sidings.
Similar Plants for Home Ore, Coal & Coke will
be commissioned in sequence

STRACHAN & HENSHAW

LIMITED

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Orders Placed

Process Control Instrumentation

ORDERS for process control instrumentation totalling £250,000 for use at the new integrated Spencer steelworks of Richard Thomas & Baldwins, Limited, near Newport (Mon), have been received by Honeywell Controls, Limited, Greenford (Middx). Temperature, flow, pressure, and oxygen analyzing equipment will be supplied for reheating and heat treatment, furnaces being installed by Priest Furnaces, Limited, Stein & Atkinson, Limited, and Incandescent Heat Company, Limited.

Instrumentation is also being installed by Honeywell for lime kilns, ore dryers, pickle line, acid recovery, and other plant mainly on direct order from RTB. Most of this instrumentation will be made in Scotland.

Order for 18 control centres worth £70,000 has been placed with Associated Electrical Industries, Limited, by Constructors John Brown, Limited, for controlling line electric motors to be used in Russian detergent plants at Volgadonsk and Shebekino.

THE BRITISH materials handling division of Yale & Towne Manufacturing Company has obtained an order for 40 Worksaver pallet trucks, worth about £25,000, from the Fred Olsen Line, Norway. Delivery will be over the next 18 months.

VALUED AT £100,000, a contract has been awarded to Stothert & Pitt, Limited, by the Amalgamated Roadstone Corporation, Limited, for three proportioning and coating plants for installation at its Criggion (Salop), Hingston Down, and Borough Green (Kent) quarries.

LARGEST rubber conveyor belt made there has been completed at the Dumfries factory of North British Rubber Company, Limited. For use in nitrate mines in Chile, it is a seven-ply belt, 24 in. wide and 2,000 ft. long. When wound the belt formed a reel 12 ft. in diameter and weighed 6 tons.

ORDER FOR A SET of intrinsically safe control and indication equipment for a new methane gas drainage system at Rossington Colliery, near Doncaster, has been placed with Heyes & Company, Limited, Wigan, by the North-Eastern Divisional Coal Board. Similar equipment is on order for methane drainage systems at two other collieries.

FISONS FERTILIZERS, LIMITED, has awarded McKee Head Wrightson, Limited, a contract for the detail design, supply, and erection of the mechanical components of a new compound fertilized granulating plant at Ipswich. McKee Head Wrighton is a company jointly owned by Head, Wrightson & Co., Ltd., and Arthur G. McKee, of Cleveland, USA.

THE BOROUGH OF WIDNES has accepted the tender of Dorman Long (Bridge & Engineering), Limited, amounting to £139,000 for the demolition of the Widnes transporter bridge which crosses the River Mersey and the Manchester Ship Canal. The bridge was built in 1905 and consists of approximately 3,000 tons of steel and iron and its demolition is scheduled to be completed in two years.

CONTRACTS for furnace plant worth nearly £1,500,000 have recently been received by Stein & Atkinson, Limited, Richmond (Surrey). They include orders for 10 soaking pits, two notched hearth furnaces, and a walking beam continuous furnace for the new Tinsley Park project of the English Steel Corporation, Limited; 10 soaking pits for the new works of the Park Gate Iron & Steel Company, Limited; and a continuous billet reheating furnace for the Greenfels mill scheme of London Works (Barlows), Limited, Birmingham.

GENERAL ELECTRIC COMPANY, LIMITED, has been awarded a contract by the Central Electricity Generating Board, for two 60 mVA. synchronous condensers, the largest machines of this type ordered for service in Britain. The contract is valued at about £360,000, and the condensers are to be installed in the Fleet substation, near Aldershot, where they will be used to provide power-factor correction and voltage regulation for the 275 kV. supergrid.

ORDER FOR THE supply of tank gauging equipment for Britain's first nuclear-powered submarine, Dreadnought, now under construction, has been received by Firth Cleveland Instruments, Limited, a member of the Firth Cleveland, Limited, group, from Vickers Armstrongs (Shipbuilders), Limited. Based on the "Pacitor" principle, the system will gauge the contents of the ballast and fresh water tanks. This latest order brings the total number of submarines fitted with the equipment to 42.

ORDERS FOR FURNACES to a value of approximately £70,000 have recently been obtained by Efco (South Africa) (Pty.), Limited. The orders cover an electri-Africa) (Pty.), Limited. The orders cover an electricarburizing furnace, a continuous mesh belt conveyor furnace, and two bogie hearth furnaces each rated at 750 kW. The bogie hearth furnaces are to be supplied to South African Railways for normalizing, annealing, and stress relieving steel castings. They will take loads up to 8 tons.

BTC Places £2,500,000 Rail Diesel Orders

THREE companies share in orders, totalling £2,500,000, which have been placed by the British Transport Commission for 27 complete main-line diesel-electric locomotives and further equipment for more multiple-unit trains to be built in railway workshops. The English Electric Company, Limited, whose share of the order is worth £1,000,000, is to supply 17 locomotives of 1,750 H.P. to be built at the group's Preston and Newton-le-Willows works. Deliveries will start in October next year.

Brush Electrical Engineering Company, Limited, a member of the Brush Group, Limited, is to provide the other 10 locomotives, each of 1,365 h.p., to be delivered early next year. British United Traction, Limited, has received the contract for 20 sets of equipment, including diesel engines and transmissions for motor cars and 20 sets of control equipment for trailer cars.

Daniel Adamson's Prospects

IN a half-yearly statement, Mr. G. N. C. Flint, the chairman of Daniel Adamson & Company, Limited, engineers and boiler makers, of Dukinfield (Ches), states that it is expected that the group will show an overall loss in 1961. Rate of loss of the parent company in the second quarter of the current year, although less than in the first quarter, is higher than expected.

The directors do not feel that they can recommend an interim dividend, against 3 per cent. previously. Output has been raised, the bulge in the order-book nearly cleared, costs are being reviewed in very close detail, and the board is implementing economies which will be effective before the end of the year. The group has £2,000,000 orders in hand and is now "well phased" for delivery dates.

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Established 1779

ANNOUNCE

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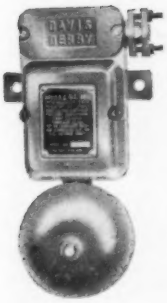
AND

THE "DAVIS" A.C./D.C. BELL



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Extremely low current consumption.

Unique and robust design.

Both models with Visual Signal if required.

Choice of 6in. or 8in. gongs.

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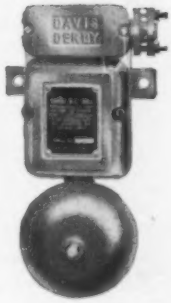

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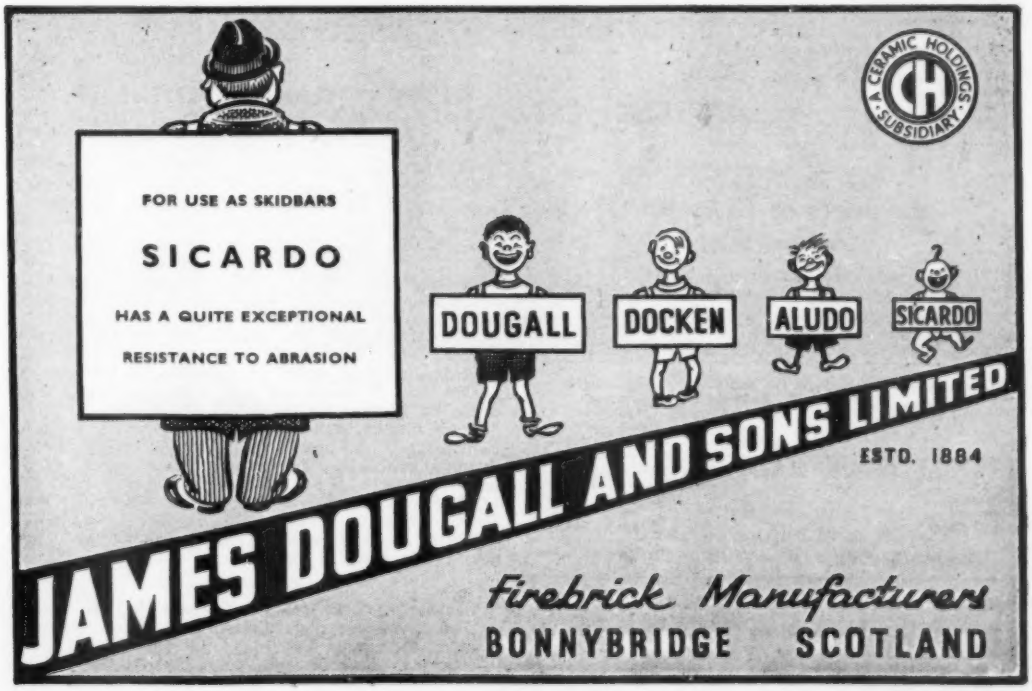


Exports of British Coal

DETAILS of British coal exports and bunker coal shipments in August, and the totals for the first eight months of this year and last, are given below.

	Month ended August 31	Eight months ended August 31	
	1961.	1960.	1961.
	Tons.	Tons.	Tons.
Categories.			
Anthracite—			
Large	2,530	50,683	46,198
Graded	8,814	165,150	153,577
Cleaned smalls	14,582	141,956	194,427
All other	32,331	200,403	272,227
Steam coal (including household)—			
Large	31,213	380,305	357,538
Graded	17,286	267,652	167,798
Cleaned smalls	102,430	779,744	908,247
Untreated smalls	96,186	699,913	930,980
Other	10,728	116,921	109,625
Gas coal—			
Unscreened	8,259	137,957	80,017
Graded	29,604	269,325	249,151
All other	—	31,680	22,471
Coking coals	17,476	100,614	119,768
TOTAL	371,439	3,342,303	3,612,024
Destinations.			
Canada	—	39,325	31,656
Other Commonwealth countries	3	19,324	7,022
Eire	81,177	760,145	801,066
Finland	1,252	44,163	34,038
Sweden	17,638	125,124	125,734
Norway	3,687	80,256	75,508
Denmark	90,605	1,027,685	787,689
Western Germany	36,241	275,480	341,190
Netherlands	91,228	536,757	783,809
Belgium	15,829	123,269	171,413
France	20,075	112,503	249,423
Portugal	8,943	92,023	104,423
Italy	—	78,060	71,303
Other foreign countries	4,761	28,189	27,750
Fuel taken on board vessels engaged in the foreign trade (including fishing vessels) for their own use—			
British flag	5,970	227,746	60,288
Other flags	4,164	28,465	21,839

Exports of Coke and Patent Fuel

THE following table gives figures of exports of coke and manufactured fuels from the United Kingdom during August, and the totals for the first eight months of this year and last.

	Month ended Aug. 31.	Eight months ended August 31.	
	1961.	1960.	1961.
	Tons.	Tons.	Tons.
Gas coke	48,123	430,904	432,044
Hard coke	65,799	305,683	291,956
Breeze	45,270	274,698	244,087
Manufactured fuel	2,019	70,089	41,757
TOTAL	161,211	1,081,374	1,009,844

POWELL DUFFRYN, LIMITED—Mr. A. Read has retired from the board.

Imports and Exports of Mining Machinery

ACCORDING to Board of Trade returns, mining machinery (other than portable power tools) valued at £161,553 was imported during August, compared with £73,493 in August, 1960. Imports for the first eight months of the year were valued at £1,335,758 against £741,525 in the corresponding period of 1960.

The appended table contains figures of export values of mining and well-drilling machinery in August and values for the first eight months of this year and last.

Destination.	Month ended August 31.	Eight months ended August 31.	
	1961.	1960.	1961.
	£	£	£
Union of South Africa	34,807	343,668	487,230
India	79,763	804,829	711,812
Australia	51,708	273,298	245,553
Canada	22,036	223,181	299,681
Trinidad	16,529	259,739	119,461
Other Commonwealth countries and Eire	311,825	838,739	1,344,281
Argentina	—	312,975	27,723
Other foreign countries	340,781	1,969,916	2,068,901
TOTALS.			
Well-drilling machinery—			
Petroleum	158,671	1,813,411	1,150,794
Other	74,151	377,532	386,197
Mining machinery (excluding portable power tools)—			
Coal-cutters, power operated—			
Complete	27,391	328,156	311,655
Parts	62,687	540,914	559,925
Conveyors, underground—			
Complete and parts	98,830	735,996	610,181
Winders, power operated	211,624	253,851	773,032
All other	224,095	976,485	1,512,858
TOTAL	857,449	5,026,345	5,304,642

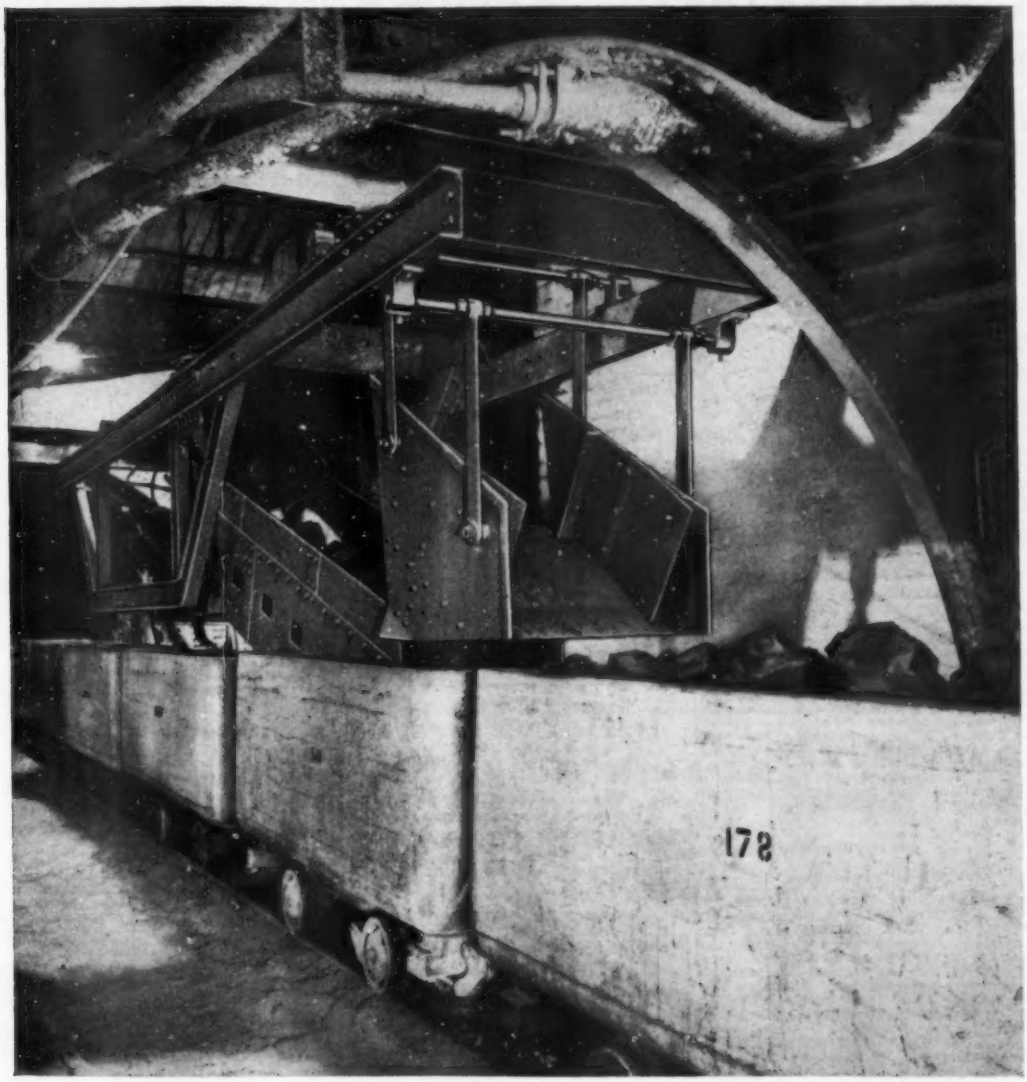
Bigger Coal Shipments Leave Welsh Ports

EXPORTS of coal, coke, and patent fuel from the South Wales ports to September 10 this year were 199,330 tons heavier than in the corresponding period last year. Foreign shipments went up from 828,279 tons to 1,027,609 tons, but coastwise were down from 934,939 tons to 925,892 tons. Iron and steel exports, at 390,919 tons showed an increase of 152,092 tons, but there was a fall in tinplate exports of 53,669 tons to 276,718 tons.

Imports of iron ore during the period fell by 499,920 tons to 3,091,343 tons, while iron and steel imports, including scrap, dropped by 166,479 tons to 91,069 tons. Pitwood and mining timber imports were down by 17,450 tons to 89,531 tons.

Total imports and exports at the various ports to September 10 this year (with the figures for the corresponding period in 1960 in parentheses) were:—Newport, 1,640,473 (1,640,864) tons. Cardiff, 1,651,408 (1,651,588) tons; Barry, 944,569 (901,942) tons; Port Talbot, 2,256,109 (2,641,852) tons; Swansea, 4,216,844 (5,708,001) tons; Penarth, 211,747 (263,849) tons; Lydney, 17,526 (20,032) tons.

UNITED STEEL COMPANIES, LIMITED—Mr. H. Smith, chairman and joint managing director of British Ropes, Limited, Doncaster, has joined the board.



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Advertisements accompanied by a remittance and replies to Box Numbers should be addressed to the Advertisement Manager, Iron and Coal, John Adam House, 17/19, John Adam Street, London, W.C.2. If received by first post Tuesday, they can normally be accommodated in the next Friday's issue.

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INLAND REVENUE VALUATION OFFICE

PENSIONABLE posts for qualified men as 3rd Class Valuers in the Mineral Section, which has offices in London, Birmingham, Leeds, Newcastle upon Tyne, and Cardiff. Age: at least 24 and under 34 on 1.10.61; extension for candidates with regular Forces service or Overseas Civil Service. Qualifications: Final examination of R.I.C.S., C.A. and E.A.I., or C.L.A.S., or B.A. (Cantab.) or B.Sc. (Lond.) in Estate Management (preferably Final examination of R.I.C.S. in Mining subdivision) or 1st Class Certificate of Competency (Mine Managers); knowledge of mining subsidence and the principles of valuation of minerals; at least four years' experience of mining. Starting salary from £858 (24) to £1,258 (34 or over); scale maximum £1,430. Promotion prospects. Write: CIVIL SERVICE COMMISSION, Burlington Gardens, London, W.1, for application form, quoting 149/61/44. Closing date 17th October, 1961.

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COMPANY NOTICE

SIR DONALD PERROTT, K.B.E., has been elected to the Board of Cammell Laird & Company, Limited.

Due to pressure of other business interests, Mr. P. B. Hunter has relinquished the Chairmanship of The Patent Shaft Steel Works, Limited, and this position has now been assumed by Sir Donald Perrott.

Mr. P. B. Hunter remains on the Board of the Patent Shaft Steel Works, Limited.

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Complete with:— Foot Frames	2
Set of Valves, each set consisting of 1 Check Valve and 1 Gate Valve	2
Flygt Pump Type B/150/200, 400/600 g.p.m., 140/130 ft., 75-68 amp. 400/440V., 1,450 r.p.m., 56 h.p. Serial No. 67865	1
Flygt Pump Type B/150/200, 400/600 g.p.m., 140/130 ft., 75/68 amps., 400/440V., 1,450 r.p.m., 56 h.p. Serial No. 58261. **RECONDITIONED**	1
Flygt Pump Type B/200, 1,600/2,000 g.p.m., 60/30 ft., 71 amp., 420V. Serial No. 46711. **RECONDITIONED**	1
Complete with the following equipment:— Metro-Vick Starter for Flygt Pump Type CAT76, 50 h.p., 400V. 3 ph. 50 cy. Serial No. SOJ.922641/1. **RECONDITIONED**	1
TEFC Squirrel Cage L/Scott Motors, 170 h.p., 1,480 r.p.m., 440V. 3 ph. 50 cy.	2
Direct-on-Line Starters, Erskine Heap Type V.C.W., 440V., 190 amps. 50 cy. Serial Nos. 293082—293083	2
Float Switches, Allen West No. F.125A, 39	2
EAC Auto Transformer Starters EAC Type 24QO Clat., 56 h.p., 50 cy. 3 ph. 346/400V. Serial Nos. L.309190 and L.265438	2
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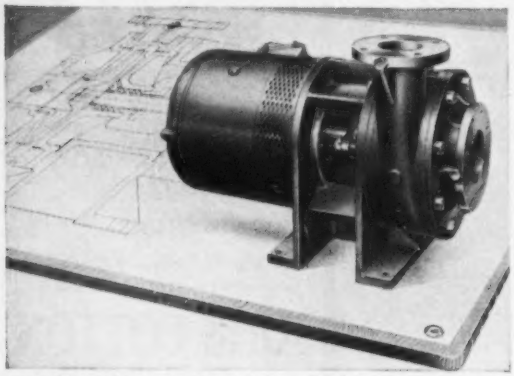

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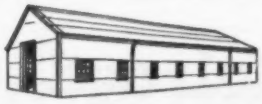

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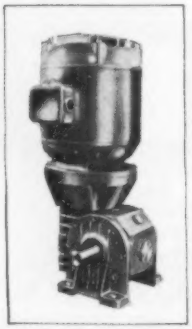

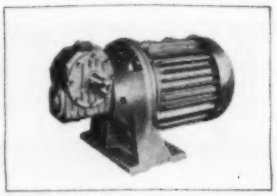

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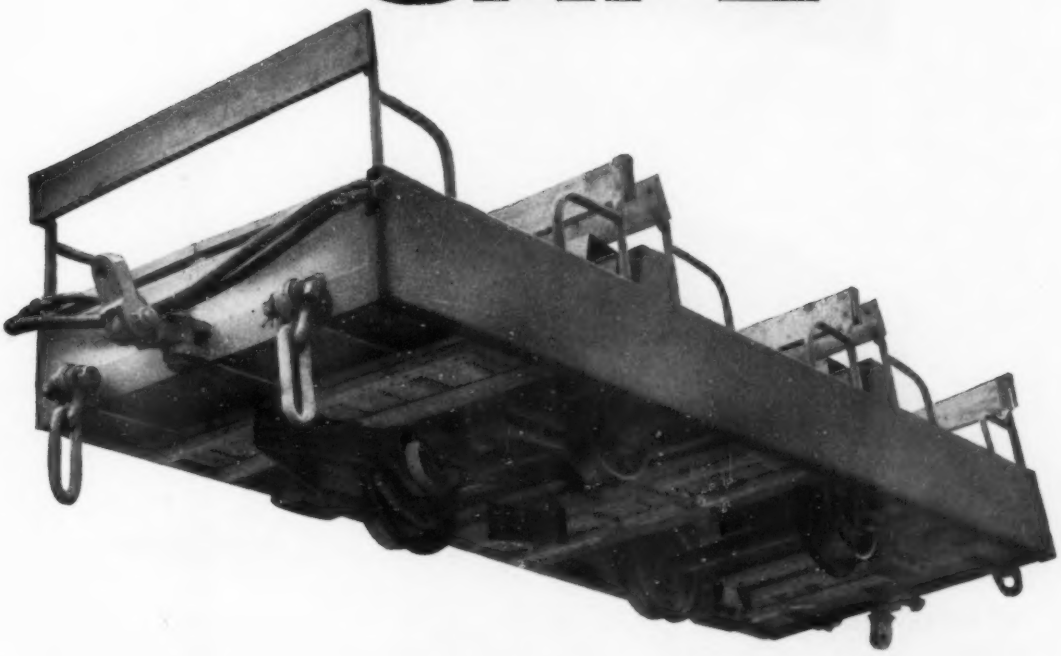

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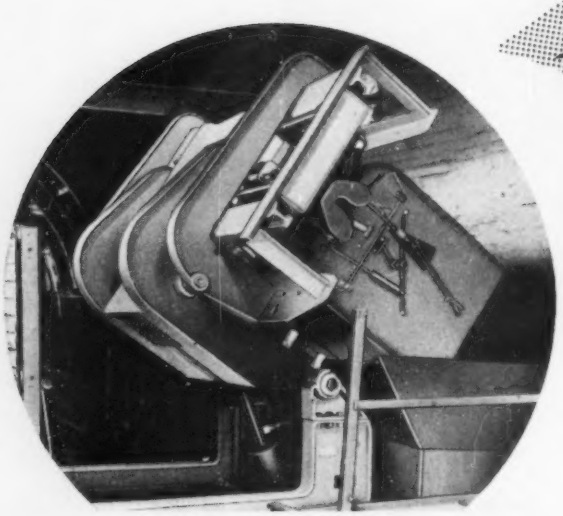

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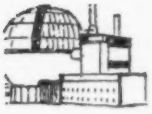

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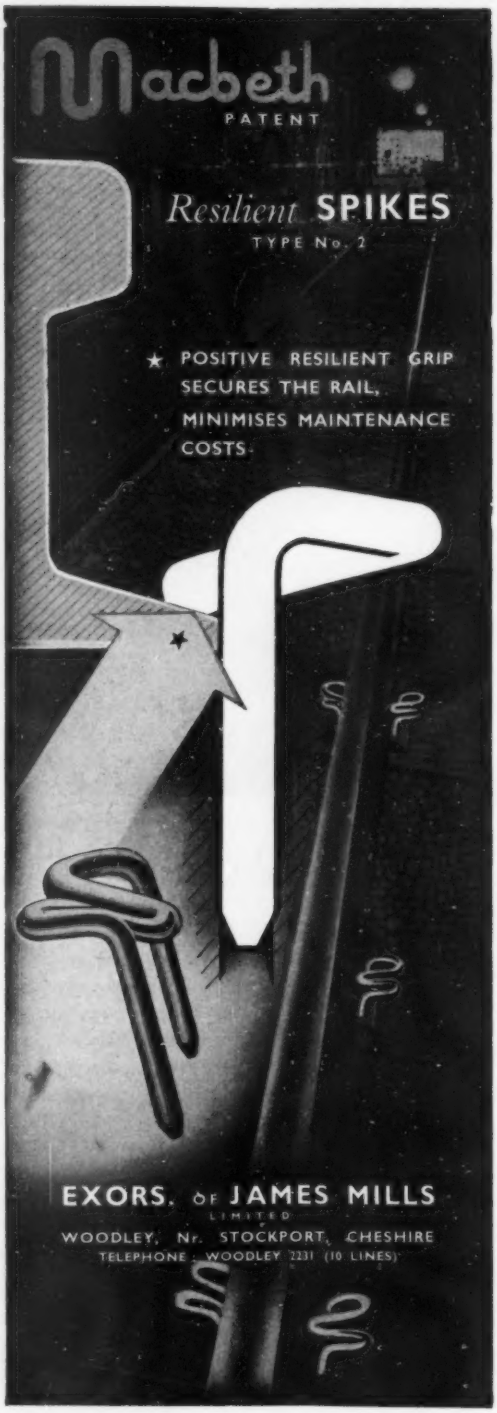

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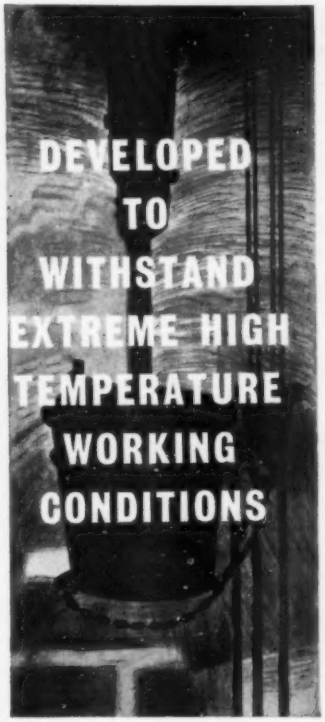

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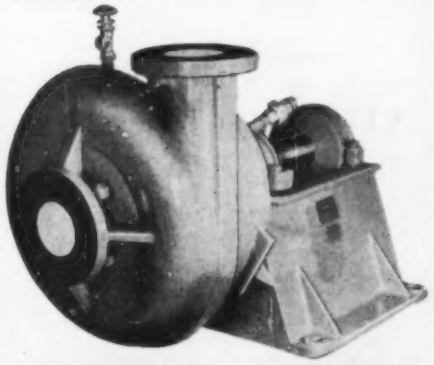

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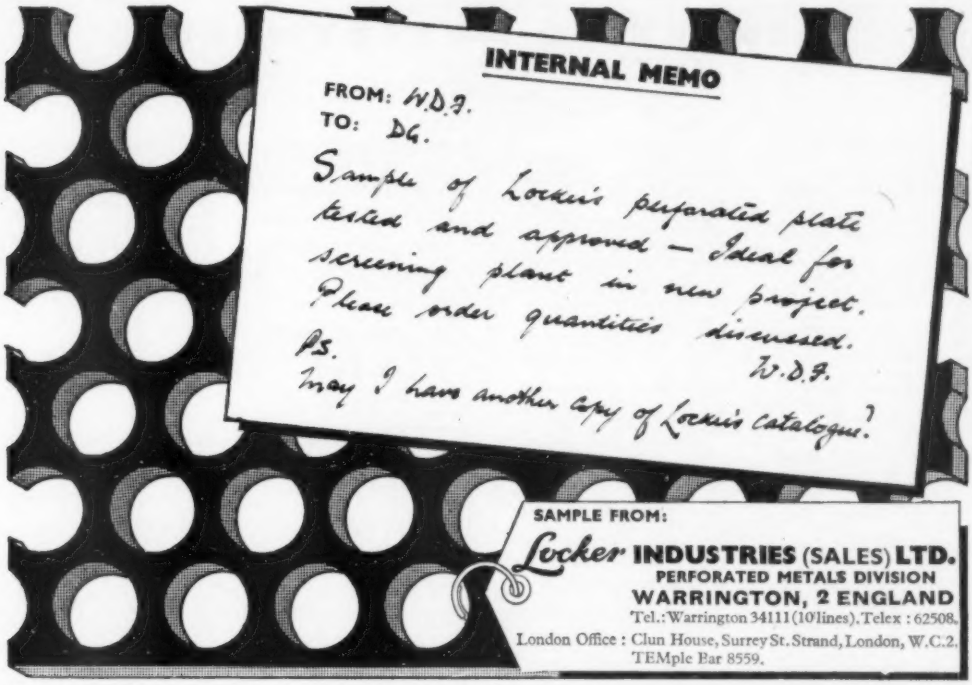
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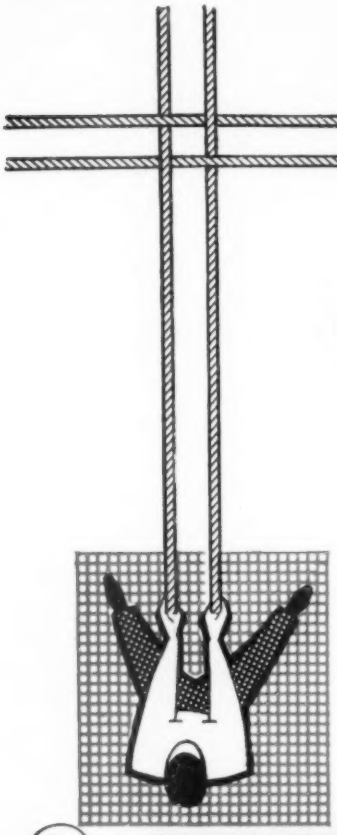

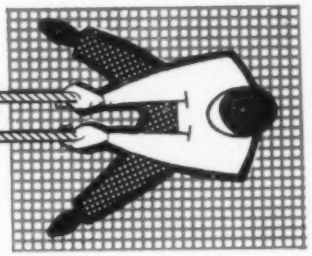

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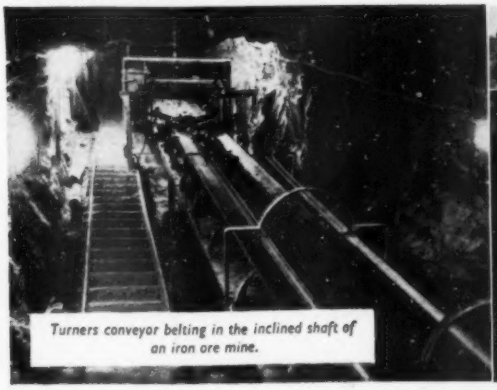

Turners conveyor belting in the inclined shaft of an iron ore mine.

Turners heat resisting belts handling granulated basic iron at Stewarts & Lloyds Ltd.

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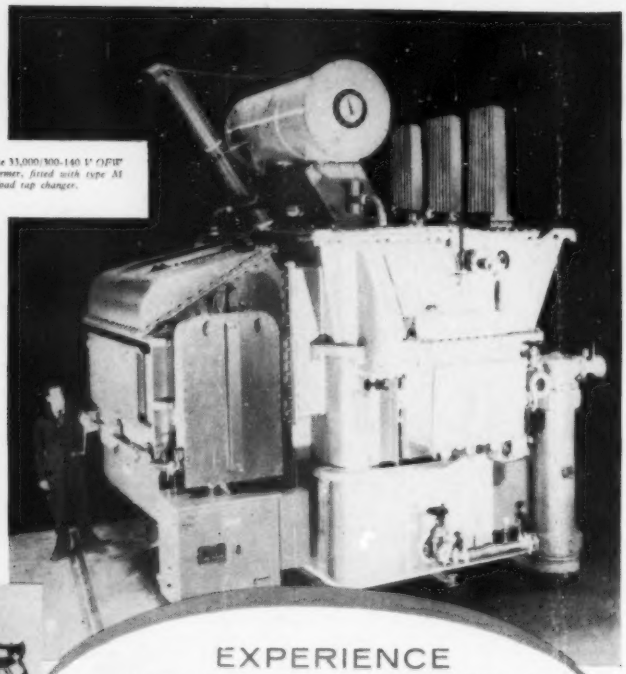

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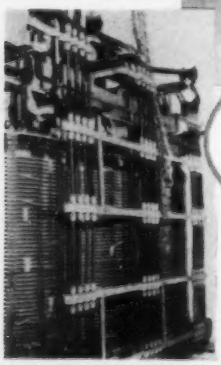

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